August 1999

A Cultural Resource and Geological Study Pertaining To Four Selected Petroglyph/Pictograph Sites On Nellis Air Force Range and Adjacent Overflight Lands, Lincoln And Nye Counties, Nevada

United States Air Force
Air Combat Command

Global Power for America

A CULTURAL RESOURCE AND GEOLOGICAL STUDY PERTAINING TO FOUR SELECTED PETROGLYPH/PICTOGRAPH SITES ON NELLIS AIR FORCE RANGE AND ADJACENT OVERFLIGHT LANDS, LINCOLN AND NYE COUNTIES, NEVADA

HEADQUARTERS AIR COMBAT COMMAND
AUGUST 1999

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	September 1999	Final: September 1999

4. TITLE AND SUBTITLE

A Cultural Resources and Geological Study Pertaining to Four Selected Petroglyph/Pictograph Sites on Nellis Air Force Range and Adjacent Overflight Lands, Lincoln and Nye Counties, Nevada

5. FUNDING NUMBERS

Contract No.
DACA 63-95-D-0022
Delivery Order No. 18

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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Environmental Studies
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Under Contract To:
Earth Tech, Inc.
1461 E. Cooley Drive
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Colton, CA 92324

8. PERFORMING ORGANIZATION REPORT NUMBER

HRC Report 1-8-19

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

United States Air Force, Nellis Air Force Base, Nevada

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

NAFB 99-03

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

See DODD 5230.24

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 Words)*

This study documents comparative results of four petroglyph and/or pictograph sites: two on Nellis Air Force Range (AFR), and two on adjacent Nellis AFR aircraft overflight lands administered by the Bureau of Land Management. A fifth cultural resources site, situated east of Beatty, Nevada, was studied as a control site for the sonic boom aspect of the study. Work focused on determining aircraft sonic boom effects on rock formations containing petroglyphs/pictographs and contrasting the two differing land management strategies (restricted vs. unrestricted access) with respect to site preservation. Documentation of the four sites (primarily study sites) resulted in the recording of 106 petroglyph and/or pictograph panels containing 868 identifiable elements. Visual observation of geological physical properties at each study site revealed that all instances of rock panel degradation were consistent with natural weathering and chemical alteration processes and did not result from sonic booms. It was determined that all four study sites have suffered from various human-caused impacts, which are a direct rsult of the two land management strategies.

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Fort Worth District; CESWF-EV-EC

14. SUBJECT TERMS

15. NUMBER OF PAGES

188 + Appendices

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Same as Report

A CULTURAL RESOURCE AND GEOLOGICAL STUDY PERTAINING TO FOUR SELECTED PETROGLYPH/PICTOGRAPH SITES ON NELLIS AIR FORCE RANGE AND ADJACENT OVERFLIGHT LANDS, LINCOLN AND NYE COUNTIES, NEVADA

Contract No. DACA63-95-D-0022
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Marjorie Barrick Museum of Natural History
University of Nevada, Las Vegas

through

Earth Tech, Inc.

under contract to

U.S. Army Corps of Engineers
Fort Worth District

for

United States Air Force
Nellis Air Force Base, Nevada

August 1999

MANAGEMENT SUMMARY

During October and November 1998, archaeologists from the Harry Reid Center for Environmental Studies, University of Nevada, Las Vegas, documented and collected data from four selected petroglyph and/or pictograph sites as a comparative study on behalf of the Nellis Air Force Base, Environmental Management Directorate, Cultural Resource Program. Two study sites, Civet Cat Canyon and Airfield Canyon, are situated on the Nellis Air Force Range (NAFR), and two others, Red Pigment Canyon and White River Narrows, are located on adjacent non-NAFR aircraft overflight lands administered by the Bureau of Land Management. A fifth cultural resources site was used as a control site for the sonic boom aspect of this study and is situated east of Beatty, Nevada.

The project was proactive archaeological research and cultural resources site management under provision and intent of Section 110 of the National Historic Preservation Act. Work was initially focused on three objectives: (1) the determination of aircraft sonic boom effects on rock formations containing petroglyph/pictographs; (2) contrasts in site preservation given two different land management strategies, restricted vs. unrestricted access; and (3) the collection of samples from selected petroglyphs/pictographs including obsidian and/or charcoal samples for the purpose of chronometric age determination. The chronometric age determination objective was later deleted from the project's scope of work, and conventional C-14 and relative chronological methods were used to address, in part, previously posed research questions.

Fieldwork at all four study sites including the sonic boom control site allowed for the collection of appropriate comparative data. Site documentation of the four selected study sites resulted in the recording of 106 petroglyph and/or pictograph panels containing 868 identifiable elements. Visual observation of geological physical properties at each study site determined that all instances of rock panel degradation were consistent with natural weathering and chemical alteration processes and not the result of sonic booms. It was determined, however, that the four study sites have suffered from various human-caused impacts, a direct reflection of two land management strategies.

Conventional chronological measures suggest that the four study sites vary in relative age, the two Nellis Range sites being older than the two non-NAFR overflight sites. Petroglyph/

pictograph element analyses indicate that the two NAFR sites are typical of the Great Basin Abstract Style, while one overflight site is characterized as being of the Pahranagat Representational Style. The other is characterized as the Great Basin Representational Style with Fremont/Puebloan influence.

During the latter part of the field phase, the chronometric age determination objective was canceled in lieu of additional research, provided within this document as a model and additional research questions. Provided are brief reviews of known chronometric dating techniques thought applicable. Petroglyph/pictograph style is discussed as a temporal and cultural indicator leading to a refined chronology for various styles thought to be or possibly present within the boundaries of the NAFR and adjacent overflight lands. Research questions are posed to test the chronology based on petroglyph/pictograph samples used for chronometric analysis.

Finally, using established evaluation criteria, the four study sites are recommended as eligible for nomination to the National Register of Historic Places (National Register) under Criteria (a) and (d). One site, the White River Narrows, is currently listed in the National Register under Criteria (d).

ACKNOWLEDGMENTS

This project has resulted in a significant contribution to the scientific study of petroglyphs and pictographs in southern Nevada. To that end, I would like to thank Mari A. Pritchard Parker, Earth Tech, Inc., Jay Newman, U.S. Army Corps. of Engineers, and Keith Myhrer, Nellis Air Force Base Archaeologist, for administering and attending to the behind-the-scene details that allowed this project to move forward to a successful conclusion, and for their support in every detail of this complex project. During fieldwork on the Nellis Air Force Range, Pat Dwyer and Jacob Sanabia officiated as personnel escorts, keeping the crew out of trouble, allowing us to conduct our work without endless questions, and at times providing us with humorous and memorable incidents captured in tall tales to be retold time and again. The field crew, variously consisting of Susan Murphy, David Smee, Heather Cain, Jeff Wedding, Diane Winslow, and Makayla Shannon, worked as a team, dedicated to their profession and the pursuit of knowledge, elusive truths at best, despite unworkable cold morning fingers, dangerous rock scrambles, spiders and snakes, and adverse accommodations and personalities of the Burro Inn, Beatty, Nevada. Not sure of what he was getting into, I would like to thank Dr. Richard Orndorff for being the project's geologist and report co-author, and for answering our endless geology questions. In helping me analyze the data obtained as part of the fieldwork, I wish to thank Pam Lawrence for the faunal bone analysis, Jeff Wedding, Diane Winslow, and Heather Cain for the lithic analysis, and Susan Murphy for plant identification. Choosing to work on paper rather than stone, David Smee has provided illustrations and maps used within this and all project reports and has produced, on the side, water colored cartoons depicting highlights and humorous project moments as only he can. Last, but not least, I wish to thank Lynda Blair for her support and sage advice and Pattie Baldwin for her administration of the contract on behalf of the Harry Reid Center for Environmental Studies. To all of these and others of whom I am unaware who worked on this project, thank you.

William G. White

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ACRONYMS/ABBREVIATIONS

A.D.	Anno Domini
B.C.	before Christ
BLM	Bureau of Land Management
B.P.	before present
CFR	Code of Federal Regulations
cm	centimeters
CRP	Cultural Resource Program
°	degrees
HRC	Harry Reid Center
IMACS	Intermountain Antiquities Computer System
m	meter
mm	millimeters
National Register	National Register of Historic Places
NHPA	National Historic Preservation Act
NAFB	Nellis Air Force Base
NAFR	Nellis Air Force Range
n	number
psf	pounds per square foot

GLOSSARY

Abstract – a term used to define elements and/or designs having intrinsic form and are composed of curvilinear or rectilinear lines or a combination of both. Abstract patterns are often referred to as geometric designs. Such images are opposite of representational forms of petorglyphs and/or pictographs.

Anthropomorph – a term used to characterize human-like petroglyph/pictograph elements.

Chronometric Age Determination – a term related to the scientific process for establishing the accurate age of an object. Such procedures are used in establishing firm chronologies for a site or components of a site.

Curvilinear – abstract elements or designs comprised of curved, circular, meandering, and/or sensuous lines.

Design – a combination or composition of petroglyph/pictograph elements depicted in an organized, planned manner executed on a panel.

Element – the smallest whole unit of a petroglyph/pictograph design where the **Design** represents a combination or composition of elements depicted in an organized, planned way. An element is a unit of analysis for a panel, the panel consisting of a single or multiple elements.

Mass Wasting – a geological term defined as the down slope movement of material under the influence of gravity and includes free fall from vertical faces, rock and debris slides, slumps, mudflows, and creep of rock and sediments. Mass wasting should not be confused with **Weathering** (disintegration and decomposition of rock at the earth's surface) or **Erosion** (incorporation and transportation of material by water, wind, and/or ice).

Panel – an area that is contained or bounded, usually by natural rock features, on a single rock surface that is not interrupted by natural features or discontinuity (empty space) of design elements. A panel can contain a single petroglyph/pictograph element or many elements in a group. Panels are the primary unit of documentation.

Patina or **Patination** – a dark, thin accretion of manganese and iron oxides, clay minerals, and minor and trace minerals accumulating on rock surfaces in arid and semi-arid regions commonly referred to as **Desert Varnish**. Petroglyph production removes the outer layer of dark varnish to expose the lighter-colored inner rock surface.

Petroglyph – a visual image created on a rock surface using techniques that include pecking, abrading, incising, scratching, or a combination of techniques. Such images are commonly referred to as rock art.

Pictograph – a visual image created on a rock surface executed in paint. Pictographs can be monochrome (single color) or polychrome (multiple colors). The most common paint colors are red, black, and white, but yellow, green, and blue are known to occur.

Plunge Pool – a natural depression at the base of a waterfall created by abrasion and impact of water transported sediment. The greater the volume of flow and the larger the quantity and size of sediment, the larger the pool that is formed.

Rectilinear – abstract elements or designs comprised of straight or angled lines.

Repatination – a process in which desert varnish accumulates after the creation of a petroglyph element. Repatination of a petroglyph is measured in relative degrees in comparison to the original, unaltered surface, the revarnishing taking an unknown period of time to accumulate.

Representational – a term used to characterize elements or designs comprised of images that have a recognizable likeness to humans, plants, animals, and/or material objects.

Style – a "visual system comprised of a repertoire of elements, figure types, figure complexes, and aesthetic modes signifying participation in a given ideographic system, interaction sphere, or panregional information exchange network" (Schaafsma 1980:8). Petroglyph/pictograph styles can have temporal and cultural definition as well as geographical limits.

Superimposition – the overlaying of one element or image over another, usually at a later time so that the relative ages can be measured.

Tinaja or **Tank** – a natural depression in bedrock that captures water. Much smaller than plunge pools, such features can be found in drainages or on the top of boulders.

Vulvaform – a petroglyph/pictograph element thought to represent female vulvae.

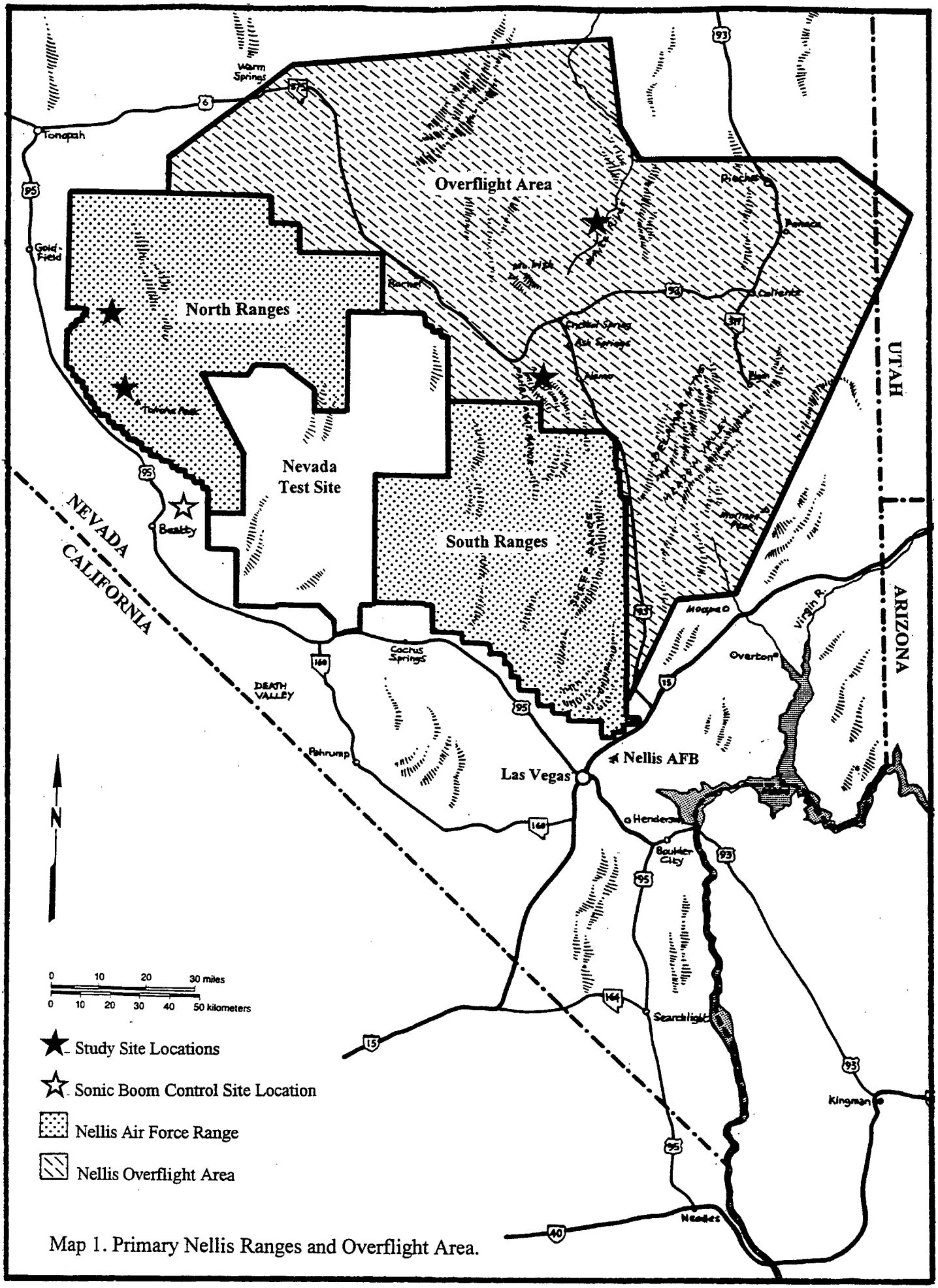
Zoomorph – a term used to characterize animal-like representational depictions.

1.0 INTRODUCTION

During October and November 1998, archaeologists from the Harry Reid Center for Environmental Studies (HRC), Marjorie Barrick Museum of Natural History, University of Nevada, Las Vegas, conducted archaeological research activities at four selected cultural resource study sites and a control site for sonic boom comparison in Lincoln and Nye Counties, Nevada. Project work was contracted with Earth Tech, Inc., the prime contractor under contract to the U.S. Army Corps. of Engineers, Ft. Worth District, on behalf of and under the auspices of the U.S. Air Force and the Nellis Air Force Base (NAFB), Environmental Management Directorate, Cultural Resources Program (CRP). NAFB's CRP is currently responsible for approximately 1,800 identified cultural resources sites on roughly 3.1 million acres of rural land commonly referred to as the Nellis Air Force Range (NAFR) (NAFB 1998). While military aircraft and weapons training and testing occur on restricted lands of the NAFR, adjacent public lands with unrestricted access to the north and east of the NAFR are subject to frequent military aircraft overflights. The use of this additional airspace is acknowledged under a Memorandum of Understanding between the appropriate land managing agencies, essentially the Bureau of Land Management (BLM) and the U.S. Air Force. Primary NAFR divisions and overflight airspace, along with general study site locations, are depicted on Map 1.

Objectives of NAFB's CRP include supporting NAFB military training missions, fulfilling Section 106 and 110 responsibilities of the National Historic Preservation Act (NHPA) and other mandated cultural resource laws, addressing Native American concerns per federal laws and Executive Orders, and providing the American taxpayer with a responsible archaeological research product (NAFB 1998). The current project was conducted as part of proactive archaeological research and site management on the NAFR under provision and intent of NHPA Section 110 and a 5-year plan outlined in the NAFB Cultural Resource Management Plan (CRMP). NAFB's CRMP also addresses certain Section 110 activities within the BLM overflight zone.

Research oriented, the project's scope of work initially focused on three objectives. First, sonic noise and vibration as a result of supersonic aircraft flight are known to affect man-made structures. The effects, if any, of sonic booms to natural rock formations, particularly those



Map 1. Primary Nellis Ranges and Overflight Area.

containing petroglyphs and/or pictographs, are presently unknown and should be examined both on the NAFR and the adjacent overflight zone. Secondly, contrasting land management strategies exist between the NAFR and adjacent public lands (restricted versus unrestricted access), and impacts to cultural resource sites managed under the different strategies should be comparable. As noted by Schaafsma (1986), dating is a major goal in petroglyph/pictograph research. Although currently in a developmental stage and sometimes controversial, chronometric age determination techniques developed over the last two decades now promote comparable petroglyph and pictograph dates. The collection and analysis of material samples removed from selected petroglyphs and pictographs at the study sites was the third objective of this project.

Over the course of the fieldwork and during the drafting of this report, the project's scope of work remained relatively constant, with the exception of the chronometric dating of petroglyphs and pictographs. The chronometric objective of this study was eliminated from the overall project in lieu of additional age determination research modeling and questions as encouraged by the Nevada State Historic Preservation Office and participating Native Americans. Chronological data derived from field recovered C-14 samples, however, is presented in this document to partially fulfill the third objective. Basically, then, the project was a comparative study of four petroglyph and/or pictograph sites, two on the NAFR and two on non-NAFR overflight lands.

To accomplish the stated objectives, it was first necessary to thoroughly document the four study sites using current archaeological methodology. Detailed site documentation not only provides baseline site data for a comparative study such as this, but also documents existing conditions that can be used by resource managers in comparing changing site conditions over time. The latter aspect is important in cultural resources management for the measurement and assessment of both natural deterioration and unfortunate human-caused impacts to cultural resources sites.

This report represents the analysis of comparative data collected during the fieldwork phase used in addressing stated research questions, one of several tasks accomplished under this contract. Previous tasks included a literature review pertinent to the study areas under consideration (White 1998a) and a project implementation plan (White 1998b). Site documentation at the four sites (one site containing three separate loci) resulted in the recording of 106 petroglyph and/or pictograph panels. Depicted on those panels were 868 identifiable elements that were categorized into 105

analytical types. Although chronometric dating of the petroglyphs and pictographs did not occur, standard archaeological radiocarbon age determinations were obtained from three charcoal samples collected from subsurface probe units as allowed by the scope of work and defined in the implementation plan (White 1998b). Other than the radiocarbon dates, all other dates discussed in this document are based on relative chronologies as they apply to the region and derived from past archaeological studies proposed by researchers including Shutler (1967), Hester (1973), Fowler *et al.* (1973), Lyneis (1982), and Warren and Crabtree (1986).

1.1 SELECTED STUDY SITES

Research activities were conducted at four known petroglyph and/or pictograph sites that had been previously subjected to various levels of site documentation, some below current standards. Of the 27 petroglyph and/or pictograph sites initially thought to be suitable for this study, 4 sites were independently selected based on an *ideal* set of criteria for comparative reasons and to meet the initial objectives of the study (White 1998a). Selection criteria included the presence of both petroglyphs and pictographs, evidence of prehistoric habitation to obtain possible obsidian hydration and/or standard C-14 radiocarbon dates, accessibility to the recording crew and field observers, and site size limitations given time and budget constraints. Similarity of rock types, environmental setting, and sonic boom occurrences were additional criteria critical to this study. Two sites were selected for analysis on NAFR's north range: Civet Cat Canyon (26NY369) and Airfield Canyon (26NY2252). The remaining two sites, Red Pigment Canyon (26LN4232) and the White River Narrows (26LN210), Loci I, II, and III, were selected from adjacent BLM lands in the non-NAFR overflight zone. A control site (26NY7957) used in the sonic boom analysis was selected outside the region where sonic booms resulting from military aircraft flights are allowed. Characterization of the four primary study sites is discussed below.

1.2 NATIVE AMERICAN INVOLVEMENT

Native American involvement was an integral component of this project. Initial and continuous involvement included consultation between NAFB's archaeologist, Keith Myhrer, and participants in the NAFB Native American Interaction Program, members selected from the Consolidated Group of Tribal Organizations. This group includes Richard Arnold (Southern Paiute), Coordinator, Betty Cornelius (Chemehuevi), Felton Bricker (Mojave), Gaylene Moose (Owens Valley Paiute), and Maurice Frank-Churchill (Western Shoshone). Site visitation and draft document review and comment were also relevant to their participation in this study. Native American participants are viewed as experts in their cultural heritage and an asset to studies such as this.

1.3 ROCK ART

What is rock art and why is it an important problem domain for research? Petroglyphs and pictographs, commonly referred to as "rock art" even though the subject matter may or may not have functioned as art by Western standards, are the product of deliberate human action. Petroglyphs and pictographs are executed within an archaeologically definable cultural context. Although variously referred to as rock art, rock images, rock engravings, and/or rock paintings in both professional and popular literature, the terms "petroglyph" and "pictograph" are used throughout this document to refer to the appropriate class of graphic depiction on rock surfaces. The aesthetic function that the word "art" implies is a conceptual research domain that is not treated in this study.

Generally, petroglyphs are visual images, both geometric abstract and representational shapes, that have been intentionally produced by abrading, pecking, scratching, incising, and/or a combination of techniques on a selected rock surface. Petroglyphs in the Great Basin can be found on any type of volcanic or sedimentary rock face and usually occur on those having a dark patination or rock varnish on the outer exposed surface. Petroglyphs are produced when a particular technique is used to reveal the rock's lighter, natural undersurface in comparison to the darker, outer surface. Not unique to the Great Basin, petroglyphs are found throughout the world where suitable rock

surfaces are present and are the product of a universally humanistic behavior.

Pictographs, on the other hand, are images that are produced as the result of applying paint to suitable rock surfaces, either with the hand or by using plant fibers for a brush. Paint used prehistorically consisted of an inorganic component, usually mineral oxides, and an organic binder, such as animal fat or blood, which allowed the pigment to adhere to rock surfaces. In some instances, a suitable rock face may be prepared by abrading or rubbing the surface to present a relatively smooth rock canvas. Paint can also be applied to petroglyphs, decorating or enhancing the pecked images. Like petroglyphs, pictographs have been identified the world over, the most famous being the cave paintings found in Spain, Portugal, and France. While pictographs occur in Nevada, they are not as abundant as petroglyphs (Woody 1997).

With exception, archaeologists in North America in the early and middle decades of this century were inclined to ignore petroglyphs and pictographs, focusing instead on stone tools, ceramics, and other more definable archaeological manifestations. More recently, scholarly interest has occurred to boost and make this neglected subject a proper field of inquiry. It is generally accepted that petroglyphs and pictographs are visual images that convey and record an idea or occurrence and have meaning, either literal or metaphoric, as expressed through graphic means. The images represent a complex symbolic system created to communicate ideas or concepts basic to the cultural life and the definition of the physical and spiritual world of the person creating the work. Such symbols are visual images that elicit cognitive function and/or oral narratives, evoking a response in the viewer. The images have the ability to recall or summon emotions, values, memories, states of being or experiences, a sense of mystery, and verbal expression in the form of stories; in a sense, the images have power. Because petroglyphs and pictographs represent the iconic mind set of a particular individual, culture, or cultural groups, the "study of rock art may potentially allow insight into the subjective human experience that has been objectified by symbol" (Woody 1997:4). Additionally, petroglyphs and pictographs are "complex graphic imagery that reflects nonmaterial concepts and ideologies not necessarily represented in other aspects of the archaeological record" (Schaafsma 1985:237).

In the Great Basin, it must be remembered that some design elements can be culturally specific, unique to a given area as expressed in a particular, unique style, or pan-cultural, design

elements shared, accepted, and repeated across vast regions by numerous cultural groups. For example, the depiction of bighorn sheep with the head and horns viewed in profile have an extensive geographical distribution including the Great Basin, the Southwest, and Columbia River Plateau. In contrast, bighorn sheep depicted with a head-on view of the horns has a limited distribution, concentrated primarily in the Coso Range of California.

2.0 ENVIRONMENTAL CONTEXT

All four study sites are unique in micro-environmental settings while sharing similar macro-environmental characteristics with each other and the larger Basin and Range Physiographic Province of the Great Basin in which the sites are found. In site comparisons, both the White River Narrows and the Civet Cat Canyon sites are situated in deeply eroded canyons that offer natural travel corridors for water runoff, animals, and humans. The Airfield Canyon and Red Pigment Canyon sites are found within narrow confines with high rock walls, offer dependable water sources with water being captured in naturally eroded tanks, tinajas, or plunge pools, and are roughly equivalent to box canyons. Civet Cat Canyon, at an elevation of 5,120 feet, and Airfield Canyon, at 5,300 feet, are situated on the northwestern and southwestern edges of Pahute Mesa. Part of the ancient White River watershed draining large portions of eastern Nevada into the Colorado River, the White River Narrows site is at an elevation of 4,680 feet. Red Pigment Canyon is situated on the eastern slopes of the Pahranagat Range, draining into the Pahranagat Valley and White River drainage, at an altitude of 5,248 feet. Red Pigment Canyon, with a wide range of native vegetation, appears to receive a higher percentage of precipitation in the form of summer rain and winter snow than the other three study sites, which are much dryer despite roughly equivalent elevations between all sites. A fifth site, utilized only as a control for the sonic boom analysis, is near Beatty, Nevada, at an elevation of 3,840 feet and is not further discussed outside of the sonic boom context. The differences and similarities between the four primary study sites are further reflected in the observed plant resources.

2.1 FLORAL AND FAUNAL RESOURCES

Plant lists were prepared for each site during field recording. The flora found at the Civet Cat Canyon, Airfield Canyon, and White River Narrows sites can be generally characterized as representing the low sagebrush community, while in Red Pigment Canyon, the general biotic community is pinyon/juniper forest with some riparian overtones. Identified plants for all four sites are presented in tabular form for ease of comparison (Table 1). Of the 38 plant species identified,

only Mormon Tea (*Ephedra* spp.) and Rabbit Brush (*Chrysothamnus nauseousus*) were represented at all four sites. The greatest diversity of plant material was found at Airfield and Red Pigment Canyons, unique in the types of flora identified at each site.

The following fauna common to central and southern Nevada was encountered or observed during the course of the fieldwork phase. Within the confines of the White River Narrows, a small herd (7) of Mule Deer (*Odocoileus hemionus*) was observed grazing on the dry grasses of the canyon floor. Two tarantulas (*Aphonopelma* sp.) were encountered at Airfield Canyon; one crawled up a crewmember's pant leg during a subsurface probe, and the other crawled across the rock face of a petroglyph panel during recording. Also encountered at Airfield Canyon, providing both comedy and anxious moments for crewmembers, were two snakes, a lethal rattlesnake (*Crotalus* sp.) and a non-lethal unidentified variety. Although deer were not viewed in the area of Red Pigment Canyon, faunal bone material observed at the site and prehistoric hunting blinds in the general vicinity suggest that deer probably occupy or occupied the area. Fresh scat and a broken, grossly healed (periosteal infection) coyote femur implies that this species frequents the Red Pigment Canyon site.

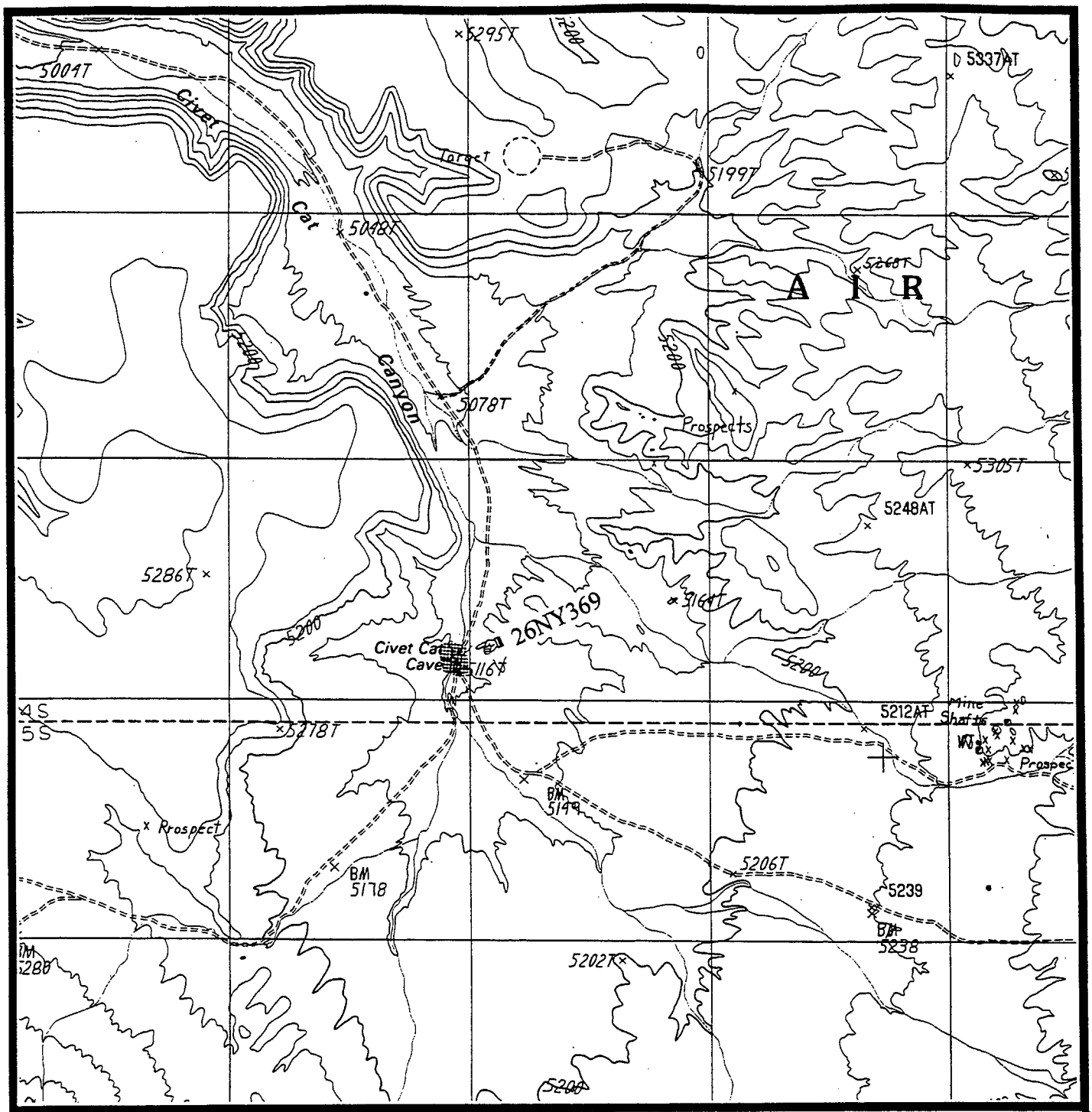
2.2 SITE GEOMORPHOLOGY

As with the flora and fauna representation, the geomophology of each site varies, despite the volcanic origin of all four study sites in the distant past.

2.2.1 Civet Cat Canyon (26NY369)

Civet Cat Canyon is a north-south-trending constriction that is approximately 100 meters (m) in length and 30 m in width (Map 2). Composed of welded tuff, the eroded canyon walls vary in height from 3 to 5 m. Civet Cat Canyon sits in a volcanic landscape that is characterized by layered ignimbrite deposits. This layering can be clearly seen on a hill slope to the northwest of the canyon. Cinder cone volcanoes lie in the surrounding areas but are not visible from the canyon floor.

Fresh surfaces in the welded tuff composition of the canyon walls, which are the result of explosive volcanism, are grey in color and are primarily fused ash with some larger rock fragment



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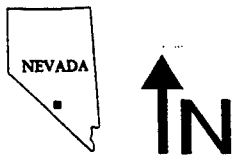
LEGEND

Site Location

Map 2. Site location of Civet Cat Canyon (26NY369)

CULTURAL RESOURCES
HARRY REID CENTER FOR ENVIRONMENTAL STUDIES
UNIVERSITY OF NEVADA-LAS VEGAS

PROJECT: NELLIS ROCK ART PROJECT
COUNTY: NYE
Map #2
Quad:
CIVET CAT CAVE, NV.
Provisional 1986



inclusions. The weathered outer surface of the Civet Cat Canyon tuff is reddened due to the presence of desert varnish. This patination is made up of wind-borne clay minerals bound to the rock in accretions by manganese and iron oxides. Manganese is found in these thin layers at concentrations that are up to one hundred times that of the surrounding soil, dust, and rock. It is the relative abundance of iron and manganese that gives desert varnish its color, which may vary from orange to red to black. Varnish on the west wall of Civet Cat Canyon is less continuous and rougher in texture than that of the east wall. The rock contains both subhorizontal and subvertical fractures, vertical fractures being more uniform in orientation than horizontal fractures.

Canyon rock surfaces are strongly affected by exfoliation. Silicate minerals in the exposed tuff have been transformed (most likely by hydrolysis) to clay minerals, which expand in the presence of moisture. Expansion and contraction cycles experienced by the clay minerals eventually break off surface rock layers. In much of Civet Cat Canyon, desert varnish is absent on the lower 1 m of the exposed rock above the present ground surface. This may be due to capillary action pulling soil water up into the rock. Water enhances the rate of chemical transformation and then enables the expansion of the resulting clay minerals, thereby producing more rapid exfoliation of the lower rock face. Chemically altered surface layers (recognizable in the field by the hollow sound they emit upon tapping) are much weaker than the unaltered rock and are thus more susceptible to subsidiary damage.

Evidence of mass wasting is minimal within Civet Cat Canyon except on the slopes in the extreme southwest of the site. Here, numerous boulders occupy a shallow slope that sits below the upper vertical face. Smaller boulders are present only at scattered locations within Civet Cat Canyon proper. A lack of rockfall debris, however, may be due to human disturbance, as rock has been used in the construction of several historic structures at this site. There is no evidence of removal of large rock debris by flooding.

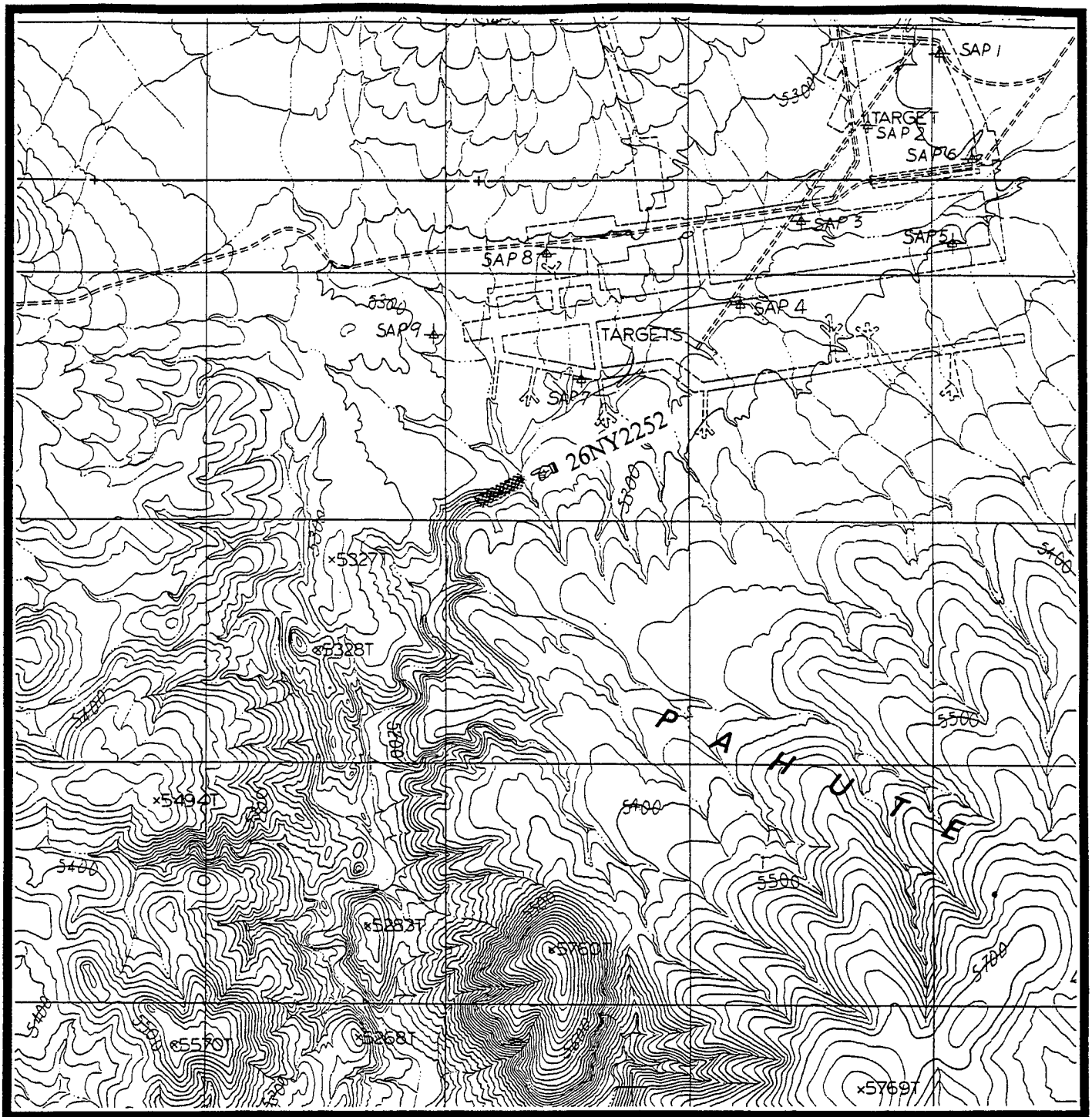
Civet Cat Canyon slopes downward to the north. An ephemeral stream channel occupies the canyon floor. Two tertiary drainages join the trunk channel approximately in the site's middle, one from the east and the other from the west. The valley floor is heavily vegetated, indicating no recent flood activity of high magnitude. Bedload is primarily sand and gravel, with some larger cobbles that are found at the canyon's south end. Two tributary canyons join in an open valley upstream of

the study site, which then constricts downstream, forming Civet Cat Canyon. In this scenario, flow velocities are higher in the lower portions of the canyon than in the more open upper valley. The expectation is, therefore, that deposition would occur preferentially in the upstream valley, decreasing the quantity of sediment provided to the Civet Cat Canyon site. The hummocky terrain and braided channels found in the upper valley support this hypothesis. A 10-m-deep dry well feature at the site exhibits a sequence of bedded alluvial sands and gravel. Civet Cat Canyon appears to be an aggradational environment under present climatic conditions.

2.2.2 Airfield Canyon (26NY2252)

Airfield Canyon trends in a southwestern direction (downstream) for a distance of approximately 500 m before turning in a more western direction to drain a vast area of Pahute Mesa into Tolicha Wash (Map 3). Prominently incised canyon walls are separated by 30 m at the head, with increasing separation in the downstream direction. The canyon's head is a nick point, a natural amphitheater with incised potholes at the tip, and a basal plunge pool with walls that are 10 m in height. The structural surface that makes up the desert floor above Airfield Canyon dips in a northeastern direction, whereas the canyon floor dips in a counter southwestern direction. Due to this disparity, the canyon walls uniformly increase in height downstream of the nick point. As with the Civet Cat Canyon site, local stratigraphy is dominated by welded tuff layering. The rounded hills that sit atop the canyon walls are alluvium that is overlain by a tightly interlocking desert pavement of volcanic rock.

Airfield Canyon's walls are composed of welded tuff, which is grey in color on fresh surfaces. Desert varnish, orange to brown in color, covers much of the exposed rock. The tuff is vesicular in spots due to exsolving gases that were trapped during deposition of the ash flow. There are also rock fragment inclusions present, many of which have been partially melted by the surrounding tuff. These represent surface material that was picked up and incorporated into the ash flow as it moved across the landscape prior to deposition. Lichens (orange, green, and black in color) are present on the rock walls. They are much more prevalent on the southeast canyon wall than on the northwest wall. This is because the southeast wall faces toward the north and is



MILES 0 1

KILOMETERS 0 1

SCALE 1:24000

LEGEND

Site Location

CULTURAL RESOURCES
HARRY REID CENTER FOR ENVIRONMENTAL STUDIES
UNIVERSITY OF NEVADA-LAS VEGAS

PROJECT: NELLIS ROCK ART PROJECT
COUNTY: NYE
Map #3
Quad:
TOLICHA PEAK, NV.
Provisional 1986

NEVADA

N

Map 3. Site location of Airfield Canyon (26NY2252).

shaded, allowing it to hold additional moisture. Both horizontal and vertical fracturing are present. The location of the nick point at the head of the canyon may be the result of the presence of a near-vertical fracture that is oriented perpendicular to the flow direction.

Exfoliation strongly impacts the rock surfaces. Silicate minerals have been transformed via hydrolysis to clay minerals, which then absorb water and expand. Subsequent expansion and contraction cycles have weakened and broken surface layers of the exposed rock in Airfield Canyon. Exfoliation is most apparent on the lower 1 m of the rock wall at the head of the canyon. This is probably due to the abundance of water in the plunge pool and the upward migration of moisture into the rock due to capillary action.

Evidence of mass wasting is abundant within the canyon. Talus piles occur beneath both the north and south canyon walls. Boulders up to 5 m in diameter are ample evidence of this process. These debris piles represent a number of fall events over a long period of time, as is demonstrated by the relative freshness of the exposed faces of the blocks. Areas of debris from the north and south walls meet to create a natural blockade across the wash floor. Most mass wasting debris rests upon shallow alluvial slopes/terraces beneath the vertical canyon walls.

As stated earlier, Airfield Canyon drains to the southwest, the slope being opposite in orientation to that of the structural surface orientation defined by the welded tuff. This may indicate uplift of the bedrock units after the formation of the stream channel. An ephemeral stream channel, which is 1 m wide, extends from the plunge pool at the canyon head. The valley floor is well vegetated, indicating little recent high-magnitude flooding. It is suggested that the present hydrologic system is inadequate to have carved the canyon and did not produce the present geologic features. Much of what is seen at Airfield Canyon was probably created during and immediately after the latest glaciation, a period of excessive regional water movement. Four ephemeral channels converge above the nick point, one each from the northwest, north, northeast, and east. The largest of these channels originates from the northeast. Channels from the northwest, north, and northeast converge before flowing into the canyon. There are two potholes that have been carved to a depth of 5 m into the caprock by stream erosion. It is highly unlikely that these features could have been formed under modern arid conditions. The three channels mentioned above converge at the most western of the two potholes, and the rock face below this feature is stained black. This appears to

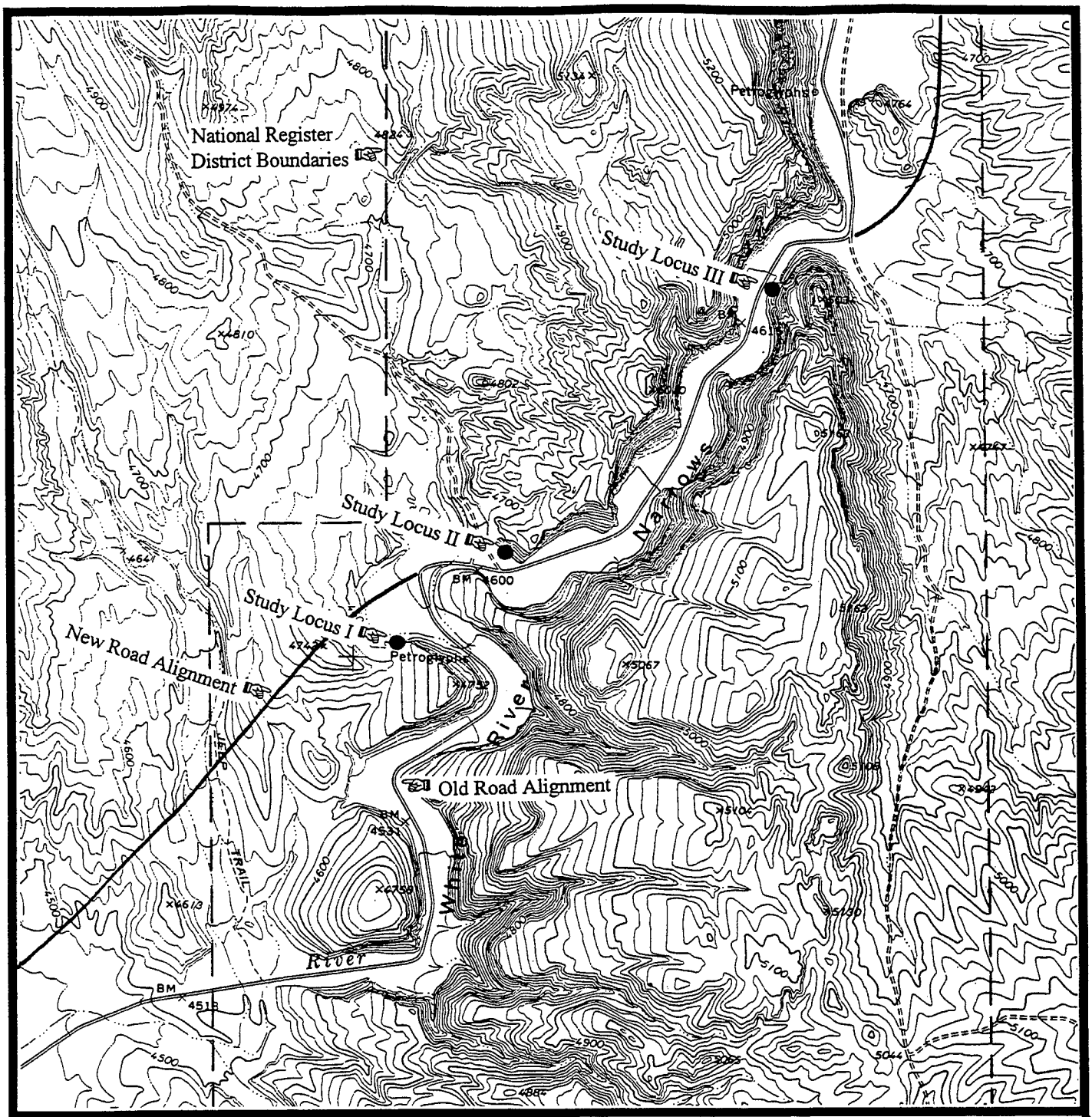
be a sign of organic activity and implies that water flows from the western pothole on a regular basis (considerable water was found in this pothole during fieldwork). An organic stain is absent below the eastern pothole. Desert varnish is heavy in this pothole, and there are numerous well-preserved petroglyphs pecked into the varnish, indicating that erosion has not occurred there for a long period of time. Approximately 5 m in diameter, the plunge pool at the base of the nick point contained water during field recording. Several small pools exist along the ephemeral channel within the canyon. They were empty, but some of them recently held water, as evidenced by the presence of cracked mud.

2.2.3 White River Narrows (26LN210)

Consisting of three separate loci, the White River Narrows sites are all situated along the dramatic cliff walls eroded by the former White River (Map 4). Locus I sits on the outside bend (horseshoe) of the former river channel, which was confined by walls composed of welded tuff. Locus II is upstream (north) on the same side of the channel as Locus I and at the junction of a secondary tributary and the main channel. Locus III is upstream from Locus II, on the opposite side of the channel. The channel itself is broad, flat, and heavily vegetated with grasses where undisturbed by modern roads. There is no evidence of recent high-magnitude flooding. The modern ephemeral stream is not responsible for carving the large 1.5-mile-long Narrows.

The canyon wall where Locus I is situated consists of buff-colored welded tuff, which exhibits vesicles created by exsolving gases during primary ash flow deposition. Also present are rip-up clasts of country rock that were incorporated into the ash flow as it moved across the ancient landscape. A light coating of desert varnish (brown in color) and lichens (black, orange, and green) cover the rock face. What appeared at first to be large areas covered with black desert varnish turned out to be, upon closer inspection, walls that were completely covered with black lichen. Moss is found at the base of the rock wall. The walls themselves dip toward the west.

Rock at Locus I consists of two layers with differing physical characteristics. Both units are approximately 10 m thick and are separated by a fracture zone. The lower unit is heavily exfoliated and pitted; desert varnish and lichen coverage is spotty. Exhibiting much less exfoliation and pitting,



MILES 0 1

KILOMETERS 0 1

SCALE 1:24000

LEGEND

● Site Location

CULTURAL RESOURCES
HARRY REID CENTER FOR ENVIRONMENTAL STUDIES
UNIVERSITY OF NEVADA-LAS VEGAS

PROJECT: NELLIS ROCK ART PROJECT
COUNTY: LINCOLN
Map #4
Quad:
White River Narrows, NV.
1970

NEVADA

N

Map 4. Site location White River Narrows (26LN210)

the upper unit retains a greater degree of desert varnish and lichen growth. Additionally, the upper layer appears to be more competent than the lower unit, probably resulting from a higher temperature of deposition and thus greater welding of the pyroclastic material. Because the units are dipping to the west, the lower unit is at ground level at the east end of the outcrop, and the upper unit meets the ground at the west portion of Locus I. Vertical and horizontal fractures are exposed in the lower unit, while the upper unit exhibits only vertical fractures.

Little evidence of mass wasting exists at Locus I. Those boulders and cobbles found at the cliff base do not exhibit fresh breaks. The lack of rockfall debris may be a function of changing climate during the Pleistocene Period when the White River was an active drainage; undercutting of the rock wall by the channel probably resulted in a great deal of mass wasting. Under the present arid conditions, no undercutting is occurring; hence, very little mass wasting can occur. Talus from the Pleistocene Period has since been buried by sediment, part of valley infilling, and is no longer visible at the surface. Sediment infilling has also covered some petroglyph elements, suggesting possible buried cultural surfaces.

Locus II, where pictographs have been depicted, contains interesting rock material of an intermediate composition that is darker in color than the other welded tuffs encountered in this study. Color changes are the result of a higher iron and magnesium content. Fresh surfaces are black and salted with white phenocrysts. Weathered surfaces are a dark grey to brown, and orange staining occurs where iron-rich minerals have oxidized. Rip-up clasts, fragments of county rock over which the ash flow moved prior to deposition, are present. Exfoliation is occurring on portions of the rock face. The unit is approximately 1 m thick and is overlain by a tuffaceous cliff face that is 20 to 30 m high. Exposed below the unit of interest are two additional thin tuff layers, both light in color and highly friable. Layered units are dipping to the west.

Situated on the upstream side at the junction of a secondary tributary and the main channel is a gently sloping bench beneath the cliff face at Locus II. The bench comprises sand, gravel, and cobbles, probably of alluvial deposition, as well as rockfall debris from exposed rock units above the bench. Rockfall appears to be an ongoing process here, perhaps aided by the fact that the lowest tuff layers appear to be very poorly welded, hence weak and easily undercut.

Salmon-colored welded tuff outcropping at Locus III is 10 m high and 30 m wide and

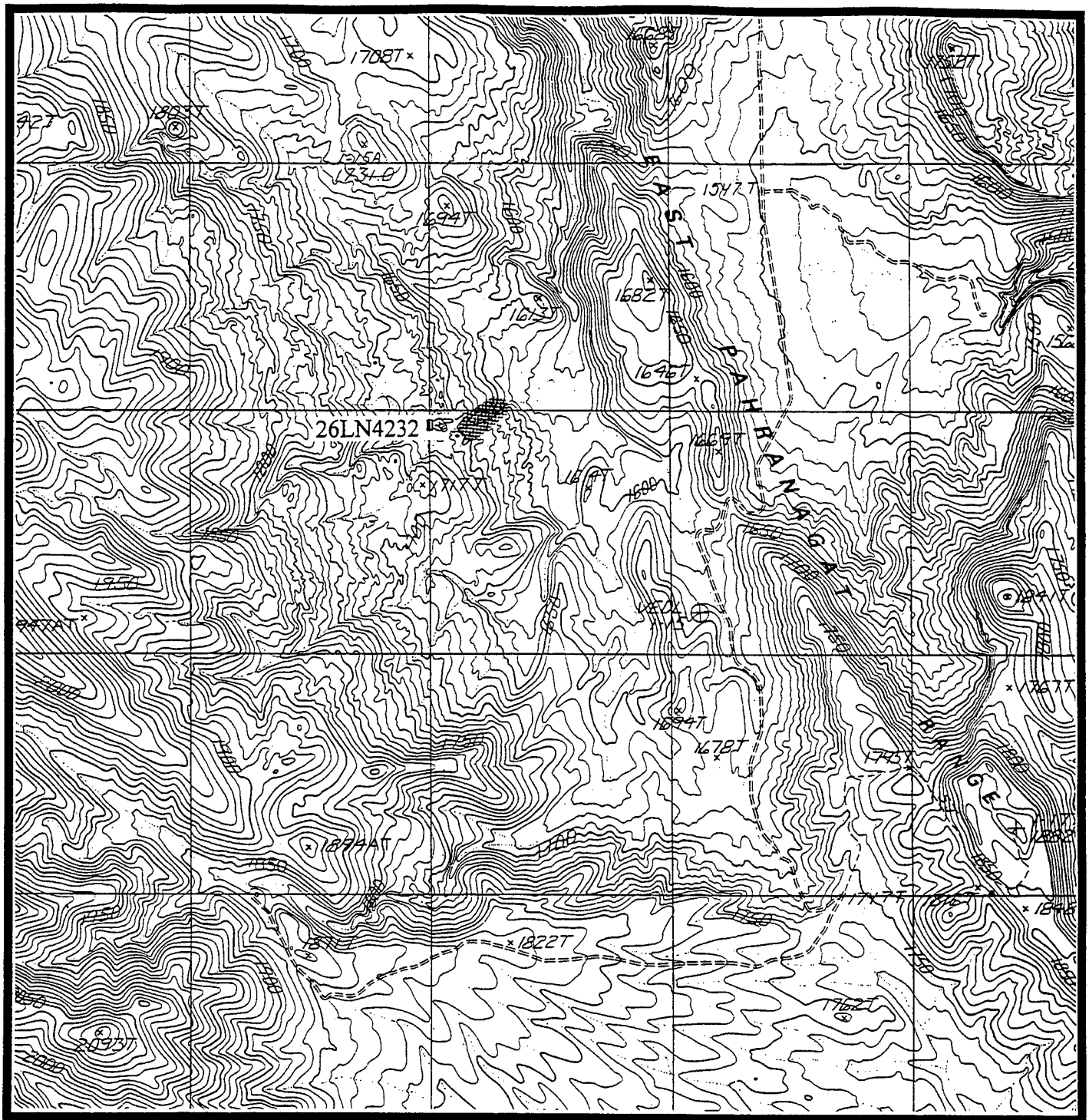
exhibits numerous horizontal and vertical fractures. The majority of the face is unpatinated, but portions high on the outcrop are blackened by desert varnish and are covered with lichen. Scattered clasts of country rock and gas vesicles are contained in this poorly welded tuff material. Most of the rock surface has suffered exfoliation, which explains the lack of desert varnish and lichen growth. Rockfall material is abundant on the sloping surface in front of the outcrop. Petroglyphs are found at the present ground surface, indicating active rock and sediment infilling since their creation. Talus material is working downward on either side of the outcrop, a result of mass wasting.

2.2.4 Red Pigment Canyon (26LN4232)

Red Pigment Canyon is a steep, ephemeral tributary roughly trending from the southwest to the northeast. It is approximately 100 m long with a drop of 10 to 15 m and is situated about 500 m distant and 100 m above the main channel that drains the surrounding valley (Map 5). Narrow at the head, the canyon widens toward the base before it opens up onto an alluvial slope. The ephemeral channel consists of a series of connected step pools hugging the southeast wall, which is a vertical cliff 10 m high (increasing to 15 m at the canyon mouth). The northwest wall slopes upward to the same height. Disparity between the slopes of the two walls is controlled by the presence of subhorizontal fractures.

Subvertical and subhorizontal fractures are present and represent an important control on both mass wasting and weathering processes. Subhorizontal fractures dip approximately 15 degrees (°) to the southeast. Mass wasting, an ongoing process in the canyon, is most prevalent on the northwest canyon wall. Because the primary subhorizontal joint system dips to the southeast at 15°, the fractures supply an oriented plane of weakness that permits rock to slide down the northwest wall. Large talus blocks up to 5 m in diameter litter the canyon floor. Much of the slope on the northwest wall is a fracture surface, and mass wasting from this wall prevents the formation of a vertical cliff, unlike the southeast wall.

Rock material comprising the canyon walls is a strongly cemented welded tuff. The ash flow from which this unit formed must have been heated to a very high temperature during deposition to form such competent rock. The tuff is grey in color, with phenocrysts (small mineral crystals which



MILES 0 1

KILOMETERS 0 KILOMETERS 1

SCALE 1:24000

LEGEND

Site Location

CULTURAL RESOURCES
HARRY REID CENTER FOR ENVIRONMENTAL STUDIES
UNIVERSITY OF NEVADA-LAS VEGAS

PROJECT: NELLIS ROCK ART PROJECT
COUNTY: LINCOLN
Map #5
Quad:
Badger Springs, NV.
Provisional 1983

NEVADA

N

Map 5. Lococation Red Pigment Canyon (26LN4232)

formed from the hot ash flow) and fragments of county rock inclusions. Many surfaces are coated with desert varnish, which varies in color from orange to brown. Lichen (in orange, yellow, green, and black) is present and covers more of the southeast than the northwest canyon wall. Moss also covers some of the southeast wall and reflects available moisture as a result of additional shading.

Local geology is dominated by stacked ignimbrites. Welded tuff that makes up Red Pigment Canyon has been spheroidally weathered. This occurs most commonly in arid and semi-arid regions to jointed, competent rock units that are rich in silicate minerals. Hydrolysis transforms silicate minerals to clay minerals, which expand in the presence of water breaking off surface layers of the rock material. Where joints (fractures) exist, weathering is enhanced, as the ratio of the exposed surface area to volume is higher here. Exposed corners and edges are weathered more rapidly than rock faces, resulting in a characteristic rounding that is diagnostic of spheroidal weathering. Spheroidal weathering is more pronounced on the northwest canyon wall than on the southeast wall. Along the channel bottom it is difficult to distinguish fallen boulders from spheroidally weathered bedrock outcrops. Exfoliation is occurring on many rock faces and is impinging in areas on petroglyph panels.

The ephemeral channel within Red Pigment Canyon includes eight connected step pools along the trunk stream with other, smaller pools occupying tributary channels. Occurring at the head of the canyon, the largest pool measures 4 m long, 3 m wide, and 2 m deep. The uppermost canyon floor consists of hydraulically smoothed chutes through which water flows upon entering the canyon. These chutes are broken up by potholes, some of which held water during fieldwork. Carved into the bedrock and asymmetric in longitudinal profile, each pool has a deeper upstream plunge area that shallows downstream. It was noted that many of the pools are partially filled with sand and gravel. Lush vegetation lines both sides of the 1- to 2-m-wide trunk channel. Trees in the valley floor reach heights of 5 to 6 m tall. There is no evidence of recent heavy flooding, and many of the hydraulic features seen in the canyon appear to have formed under wetter-than-modern conditions.

3.0 CULTURAL CONTEXT

Based on diagnostic projectile point types, a generalized chronological framework has been developed for the southwestern Great Basin that is applicable to the NAFR and overflight study areas (Warren and Crabtree 1986; NAFB 1998). Human occupation of this region is thought to date back to approximately 10,000 years before the present (B.P). The chronological temporal units, based on diagnostic projectile points, thought relevant to this study are expressed in Table 2 (NAFB 1998:Table 4.1). Brief summaries of the prehistoric periods are synthesized from Warren and Crabtree (1986), NAFB (1998), and others as cited.

Table 2. Chronological Periods for the NAFR and Overflight Study Areas.

Period	**Chronological Range**	**Diagnostic Projectile Points**
Numic	800-150 BP	Desert Side-notched, Cottonwood
Saratoga Springs	1500-800 BP	Rose Spring, Eastgate, Cottonwood
Gypsum	4000-1500 BP	Elko Series, Gypsum, Humboldt Series
Pinto	7000-4000 BP	Pinto Series
Lake Mojave	10,000-7000 BP	Lake Mojave Series/Silver Lake Series

3.1 LAKE MOJAVE PERIOD (10,000-7000 B.P.)

Archaeological evidence suggests that human occupation of the southwestern Great Basin occurred roughly 10,000 years ago. Artifacts from this time period, Late Pleistocene/Early Holocene transition, are most often associated with surface sites identified at extinct Pleistocene lake shorelines. Occasionally, Lake Mojave Period sites are identified in association with springs or along the margins of large stream channels. The artifact assemblages are characterized by a wide variety of scraper forms, large projectile points, ovate and lanceolate knives, crescents, and a range of large cobble choppers and hammers. Stone tools are primarily made from basalt and obsidian. Slab milling stones are rare in the collections. It is argued that the artifact assemblage represents a widespread hunting adaptation focused upon large game animals. Conversely, others argue for a

generalized hunting and collecting economy with lakeside sites representing adaptation of lacustrine resources. It is not known if petroglyphs and/or pictographs were produced during this period, but any images created would probably be completely repatinated with desert varnish.

3.2 PINTO PERIOD (7000-4000 B.P.)

A major cultural adjustment occurs during this temporal period as a result of regional desiccation and the drying up of the Pleistocene lakes within the Great Basin. Sites associated with this period are often identified along stream channels and springs, and at toolstone quarries. Pinto culture people may have lived in oval housepits covered by a framework of poles as well as rockshelters where their tools have been recovered. With the exception of the projectile points, the basic tool assemblage appears similar to the earlier cultural period. Often found co-occurring with Lake Mojave period assemblages at the same sites, Pinto assemblages include leaf-shaped points and knifes, flake knives, and numerous kinds of scrapers and scraper-graver combinations, showing a strong continuity in tool manufacturing techniques. Pinto projectile points, however, differ from those of the Lake Mojave period in that they have shorter stems and are basally-indented, suggesting a change in hafting techniques. To this basic tool assemblage was added simple, shallow-basined, flat milling stones. Few Pinto Period sites have been identified; when found, they consist of surface manifestations and have poorly developed middens and relatively low artifact density. As a result, it is thought that the sites represent temporary, seasonal occupation and that the population was small and highly mobile. The Pinto Period lifeway was based on hunting large and small game, collecting vegetable resources, and increasing hard seed consumption. The production of geometric abstract petroglyphs/pictographs categorized as the Great Basin or Western Archaic Abstract Style probably began during this period based on a few chronometric dates obtained from curvilinear elements (Whitley and Dorn 1987).

3.3 GYPSUM PERIOD (4000-1500 B.P.)

This period is characterized by a slight increase in winter precipitation and a diversity in cultural assemblages, thought to reflect the influence and movement of neighboring cultural groups into the Great Basin. Compared to the previous cultural expression, this temporal period represents an intensive occupation of the Great Basin and surrounding deserts with a broadening of economic activities. Sites are more frequent and are found in a variety of topographic locations while exhibiting increased functional diversity. Identified sites, particularly in rockshelters, contain extensive midden deposits revealing a diversity in faunal remains. Also, projectile points from this period, best characterized by medium sized to large stemmed and notched points, show greater variability in both style and material. Groundstone and handstones, along with the addition of the mortar and pestle, often found associated with mesquite groves suggest an increased reliance upon hard seeds and other plant resources in their economic pursuits. Basketry and cordage recovered from rockshelters also show a dependence of plant materials. Religious practices become evident during this period in the form of small specialized objects such as split-twig figurines resembling big horn sheep and are thought to be indicative of hunting rituals. Petroglyphs and pictographs are clearly being made at this time and often portray both hunter and hunted and weapons in representational elements. Abstract petroglyph/pictograph designs continue to be created. Toward the end of this period, the bow and arrow replaces the use of the atlatl and dart as a major technological change.

3.4 SARATOGA SPRINGS PERIOD (1500-800 B.P.)

In large portions of Nevada and eastern/southeastern California, sites and tool assemblages associated with this period exhibit a cultural continuity with the previous period with the exception of projectile points which become smaller as a result of the incorporation of the bow and arrow. In southeastern Nevada, Anasazi (Basketmaker-Pueblo) influence and development is the major characteristic during this period. Cultural activities in southern Nevada are affected by Patayan/Yuman cultural groups, while eastern Nevada sees the incursion of the Fremont. All three

groups practice horticulture supplemented by seasonal rounds associated with hunting and gathering. Basketry is soon replaced by pottery. Because of the shift in subsistence strategies, people gather in larger concentrations and build village settlements consisting of pithouse and/or aboveground structures of mud and stone, particularly in the Moapa Valley and along the Virgin River. Temporary campsites with Anasazi, Patayan/Yuman, and/or Fremont cultural material suggest that wide-ranging forays into various areas are an extension of the seasonal foraging pattern as well as the development of specialized raw material procurement (i.e., turquoise, salt) and the establishment of extensive trade networks. An increase in grinding implements and the development of storage pits, particularly in dry rockshelters, points to a heightened dependence on vegetative products. Petroglyph/pictograph styles (Fremont, Virgin Anasazi, and Colorado River Styles) can be identified in specific associated areas of the southwestern Great Basin and are developed during this period. The Great Basin/Western Archaic Abstract Style continues to be an influence throughout the region.

3.5 NUMIC PERIOD (800-150 B.P.)

The beginning of this period is distinguished by the retreat and abandonment of the region by the Anasazi and Fremont cultural groups and the expansion of Numic-speaking populations. The Patayan/Yuman people continue to enter and occasionally occupy the southern portions of Nevada as indicated by the presence of buffware ceramics at numerous temporary campsites (Seymour 1997). This period is marked by the occurrence of Numic brownware pottery and Desert Side-notched projectile points. Twined and coiled basketry also appear at sites formerly occupied by the Anasazi. The tool assemblage consists of well-made triangular knives, unshaped manos and milling stones, incised stones, slate pendants, pestles and mortars, and shell beads. Subsistence patterns during this period are essentially the same as the archaic hunter and gatherer of earlier periods. This strategy is characterized by small group movement within various environmental zones taking advantage of a wide range of plant and animal resources. Such activity resulted in task-specific sites occupied temporarily and seasonally, located throughout various environmental zones. At the time of contact with Euroamericans, this economic strategy was augmented by horticulture with camps located adjacent to dependable water sources such as springs and streams. Petroglyphs/pictographs

continue to be made during this time, and the depiction of horse and rider, anthropomorphs dressed in western hats, boots, or dresses, and horse-drawn wagons were probably influenced by and created after the contact with Euroamericans. The people of this period are the ancestors of contemporary Paiute and Shoshone groups.

3.6 ETHNOGRAPHIC PERIOD (A.D. 1860s to 1930s)

Ethnographically, the study areas were occupied by two separate cultural groups, the Western Shoshone and the Southern Paiute. Recognized as distinct cultures, they are, however, of the same widespread Numic linguistic stock. Additionally, both groups generally shared similar cultural traits of adapting to the Great Basin environment at contact and into historic times.

3.6.1 Western Shoshone

Garnered from Steward (1938) and Thomas *et al.* (1986), the following discussion portrays the essence of the Western Shoshone at the time of Euroamerican contact. Generally extending from the Death Valley region northeastward in a narrow fan shape, the Western Shoshone occupied much of the central, eastern, and northeastern Nevada landscape, as well as northern Utah. Within the Western Shoshone territory, the family was necessarily the independent economic unit, with units smaller than the family surviving with difficulty. Subsistence was primarily dependent upon plant foods, with hunting serving as a complement to plant harvesting. Depending upon resource availability in both quantity and quality, a reflection of year-to-year climatic factors, families had to traverse enormous territories on a seasonal round, ordinarily ranging 20 miles or more from a residential base, maintaining a flexible itinerary. Territories exploited by families were variable in resources as well as overlapping with adjacent territories, ownership of such harvesting territories being impractical due to scarcity. From the spring through the fall, foraging and collecting was accomplished by families harvesting alone or in the company of not more than one or two other families. Hunted game provided essential food as well as clothing and certain tools; the taking of small game was a family practice, while large game hunting was a male activity. Occasionally,

communal hunts requiring a large number of people were organized in areas of abundant animal populations; it was during these communal activities that the Western Shoshone gathered for festivals.

Families belonged to small, local, geographic districts frequently centered in a well-water valley or cluster of winter villages. Membership within resident base camps exhibited a high degree of flexibility. Winter encampment location was dependent upon several factors including accessibility to cached seeds (pine nuts) and plant foods, a reliable water source, sufficient wood for house building and fuel, and absence of extremely low winter temperatures. Encampment sizes varied from one to several families. A typical winter house consisted of a conical hut, while a summer structure might be a semicircular sun shade. Because of a high degree of mobility, material possessions were limited to plant fiber or animal skin clothing, bows and arrows and nets used in hunting, fiber-based coiled basketry and twined harvesting tools, and Shoshone ware pottery made from local clays. Having an intimate understanding of their environment, the Shoshone knew of several hundred plant species that had medicinal powers. Aside from herbal remedies, they had shamans, or *pohakanti,* who could cure specific ailments or had general curing abilities. Shamanistic powers involved a direct relationship with the supernatural and were obtained through two types of visionary or dreamed experiences, one involving spirit helpers such as an animal or object and a second involving dreamed capabilities.

Forming a triangle of resource and population interaction, three major concentrations of Western Shoshone occurred around and at great distance from the two NAFR study sites and include the Beatty, Lida, and Kawich groups (Steward 1938: Figure 7). Although a temporary camp is indicated at a spring situated near the western edge of Pahute Mesa (perhaps Monte Cristo Spring northeast of Tolicha Peak), no subsistence areas or encampments have been recorded in the immediate vicinity of the NAFR study sites. A concentration of pine nut trees, a primary subsistence commodity, is situated on the flanks and summit of Stonewall Mountain. But based on Steward (1938), it does not appear to have been a major harvesting area. Obsidian may have been collected from nearby Obsidian Butte for the production of toolstones. These latter resource areas are within one day's walking distance of either of the NAFR sites.

3.6.2 Southern Paiute - Pahranagat Band

A discussion of the Southern Paiute and the Pahranagat Band has been synthesized from Kelly (1934, 1939), Steward (1938), Stewart (1942), Kelly and Fowler (1986), and Fawcett (1993). The Southern Paiute, as a collective cultural group, occupied southeastern and southern Nevada, southwestern Utah, portions of southeastern California, and northern Arizona. Similar to the Western Shoshone, the Southern Paiute generally practiced a mobile existence. Their flexible egalitarian bands conducted cyclical resource-gathering schedules in small family groups determined by the availability of wild animals and plants and by the availability and spatial distribution of water. During the summer, the Southern Paiute would be found in permanent encampments centered around valley springs and marshes; in the fall, they moved into upland areas to gather ripening plant resources such as pine nuts and yucca fruit. Winter stores of collected seeds would be cached at or near winter camp locations. Such winter habitation sites would be situated in the foothills above the valley floor where water, fuel wood, and shelter were available. Winter shelters were conical in shape, usually constructed of brush or rockshelters; summer shelters were temporary, consisting of a variety of shades and/or windbreaks. Unlike the Western Shoshone, the Southern Paiute practiced horticulture that entailed the planting of corn, squash, beans, and sunflowers, which allowed a greater flexibility in diet.

In addition to plant resources, both large and small game were hunted. Small game was, however, the chief source of protein. Rabbits were hunted individually and/or in communal drives, requiring numerous people to accomplish the task. Although generally scarce, large mammals such as deer, antelope, and mountain sheep were hunted individually or by a small party of men, sometimes under a hunt leader. Such leaders might be game shamans or "dreamers" of large game who had the ability to control the movement of game animals. Shamans, either men or women, obtained their power through unsought dreams from one or more tutelaries, usually in animal form. Shaman specialists could cure rattlesnake bites, control the weather, aid in childbirth, or general doctoring, most often by disease-object removal or soul loss restoration.

Situated on the northwest margin of Southern Paiute territory, the Pahranagat band of Southern Paiute lived in an area encompassing approximately 3,400 square miles of land with the

spring-watered Pahranagat Valley in the center. Their population numbered 171 people in the fall of 1873. Several translations exist for the name "Pahranagat": "people of the marshy spring," "people who stick their feet in water," "valley of many waters," "squash eater," or "valley of watermelons." These refer directly to either the presence of large quantities of water or domesticated foods. The Pahranagat Paiute were fairly sedentary and practiced irrigation-based horticulture in addition to the traditional Great Basin hunting-and-gathering way of life. Concentrated along the margins of lakes, marshes, and spring drainage channels, the Pahranagat Paiute developed fields of less than an acre in size during the spring and used fire to assist in the clearing and preparation. Men and women labored together in the fields, using digging sticks as gardening implements. Once planted, the fields would be tended by the elderly and children, while younger men and women foraged and hunted in upland areas. Crystal Springs became the location of large regional camps. The Pahranagat Paiute were known to have rattlesnake, arrow, and general curing shamans. Weather shamans had the ability to bring rain, and persons who used mind-altering datura were able to locate lost objects. By the middle 1860s, their way of life was disrupted by Euroamerican incursion into the valley, displacing and subjugating the local native inhabitants. The Pahranagat Paiute then became dependent on wage labor from developing ranches or at local mines, marginal hunting and gathering in mountainous areas, or were subjected to reservation life, established in the nearby Moapa Valley in 1872 (White 1990, White *et al.* 1997). Members of other Southern Paiute groups such as Las Vegas, Pahrump, and Moapa Bands, and possibly some from Utah and Arizona, may have used or visited the study areas (Arnold *et al.* 1999).

3.7 HISTORIC PERIOD (A.D. 1860s to 1940s)

In their headlong rush to the Pacific Coast, early California- and Oregon-bound Euroamerican emigrants passed over much of the inter-mountain West. Lands situated between the Wasatch Range of Utah and the Sierra Nevada Range of California were envisioned as vast expanses of hostile desert to be avoided or traversed as quickly as possible. As the California goldfields became exhausted, miners and entrepreneurs turned to those wilderness landscapes that had been initially overlooked. At the same time, the Church of Latter Day Saints sought to establish isolated,

self-sufficient colonies in the region. Slowly, Nevada began to fill in with mining camps, railroad towns, and farms/ranches. And even though Frederick Turner's (1920) classic thesis proposed that frontier America no longer existed after 1890, by 1900 a vast region of Nevada, including Nye and Lincoln Counties, remained unmapped and sparsely settled, inhabited by only a few intrepid ranchers, prospectors, and Native Americans. Mining, farming/ranching, and governing are general themes that are relevant to the study areas. These themes are expressed in the *Nevada Comprehensive Preservation Plan* (White *et al.* 1991).

3.7.1 Mining

Mining activities, including prospecting, mineral extraction, and processing, have occurred on both the NAFR and Pahranagat Valley (non-NAFR) study areas. The Pahranagat Mining District was formed in March 1865 on the southeastern flanks of Mt. Irish. It began when a prospecting party was shown a ledge of mineralization by a member of the Pahranagat Band of Southern Paiute (Lincoln 1923). In June, the party was forced by the Paiutes to abandon the area, prompted more by intimidation of increased band presence than by attack (Hulse 1971). By October a permanent camp, Logan City, was established with 100 to 200 inhabitants. Soon, over 1,000 claims were recorded, and the district's population increased to 300 souls. Ore was being shipped downslope to Hiko, where a five-stamp mill was built to process ores containing lead, silver, and copper. Ore veins lacked depth and, due to the conspicuous absence of skill, common sense, and just plain bad management of the working mines, the district was soon abandoned, the miners heading for the rich workings of nearby Pioche (Hulse 1971; Paher 1984). Although poor in mineral wealth, the Pahranagat discovery led politically to the formation of Lincoln County, where the initial county seat was placed at Crystal Spring, later moved to Hiko, and finally to Pioche.

Mineral discoveries around the turn of the 20th century at Tonopah, Goldfield, and Rhyolite brought precious metal mining to the central expanses of Nevada. Radiating out from these major mineral extraction centers, prospectors located claims of lesser fame. Surrounding the NAFR study sites are the Gold Crater, Tolicha, and Wellington Mining Districts (Cornwall 1972). Initial strikes in these districts were made in 1904 and 1905 (Ball 1906). Gold and silver were the predominant

minerals extracted in these districts, with lead also being mined in the Gold Crater District (Kral 1951). Each of the districts boasted small mining camps. Speculators at Gold Crater, however, established a townsite and placed the lots for sale, selling 200 town lots within 3 days (Paher 1984). Few miners remained through the winter at this desolate location, rather gravitating back to major centers or on to new discoveries. Despite low production and equally low ore values, work in these districts was intermittent through the 1910s and 20s, with some renewed but limited work efforts in the 1930s. Numerous two-track roads leading to the former mining districts cross Pahute Mesa; one such transportation route passes through Civet Cat Canyon, thereby allowing access to both the Wellington and Gold Crater Mining Districts from Goldfield.

3.7.2 Farming/Ranching

In addition to mining and farming, ranching has had a significant impact on the settlement of Nevada's sparsely populated interior valleys. Along with the discovery of precious metals in the Pahranagat Mining District, the hills surrounding Pioche and, later, nearby Delamar, the long and narrow, well-watered Pahranagat Valley was seen early on as a potential agricultural area capable of supplying the local mining communities with necessary food and hay products. By 1866, all irrigable land within the valley had been claimed by white settlers, who often took possession of irrigated horticultural patches tended by Pahranagat Paiute (Townley 1973; Fawcett 1993). Some of the earliest Euroamerican ranchers included families headed by Adrian Geer, James Pearson, and Henry Sharp (Stewart 1979). By the 1880s, only six white families lived in the valley: the Fergusons, Sharps, McGuffeys, Richards, Geers, and Frenchy (Stewart 1979). During the 1900 census, 157 inhabitants were recorded in the Pahranagat Valley, as compared to 30 souls in the Las Vegas Valley (Hulse 1971). In 1905, some of the best Pahranagat Valley land was purchased by incoming Mormon families as a community enterprise, resulting in the formation of the town of Alamo (Hulse 1971). Ranching remains the principal occupation in the Pahranagat Valley, and Alamo is now the largest agricultural community, followed by Ash Springs and Hiko. In addition to the large family ranches, stock allotments on public lands allow cattle to range on upper terraces and into mountainous areas beyond the limits of the valley's confines.

Oasis Valley, situated far to the west of the Pahranagat Valley, remained isolated and unsettled by whites until the 1870s. During that time and later, the development of local mining claims resulted in the establishment of a few small ranches. In 1879, Eugene Lander became the first white Oasis Valley settler, establishing a ranch while working a mine claim called the Blue Monster (McCracken 1992a). Lander later sold the ranch to his partner, William Stockton. Describing the Lander Ranch, a traveler said the valley contained "innumerable springs of cold and hot water; a rich soil which will produce in large quantities any of the varieties of field or garden produce; and a never-failing meadow, densely covered with a good quality of grass" (McCracken 1992a:9). By 1890, George Lynch, George Davis and family, John Howell, Jack Longstreet, and Montillus Beatty had claimed various portions of the spring-watered valley in an effort to make a living off the land. Beatty acquired the Lander/Stockton Ranch, married a local full-blooded Paiute (Shoshone?), fathered three children, and provided a hospitable refuge for weary desert travelers. In 1904, after the discovery of gold in the hills west of the Oasis Valley, a townsite was plotted at the lower end of the valley and was named in Beatty's honor. Beatty sold the ranch and water rights to the Bullfrog Water, Power, and Light Company for $10,000 in 1906 and moved his family to Death Valley (McCracken 1992a). The ranches in the valley provided fresh garden produce and field hay to regional mining towns and camps. Stock allotments allowed cattle to graze on public lands far from valley ranches, often necessitating line camps and stock corrals in isolated canyons, basins, and mesa tops.

3.7.3 Federal Government

Eighty-six percent of Nevada's land is controlled by various agencies of the Federal government, more than any other state. Approximately 4,145,039 acres of public land are withdrawn for defense-related use; of that figure, NAFB and the NAFR encompass 3,057,279 acres (Department of Defense 1991). In an effort to establish an Army air gunnery training school, Major Schlatter landed at the Las Vegas Western Air Express Field on October 1, 1940, which had been in operation since 1929 (U.S. Air Force 1997). Finding the field an ideal location for its needs, the Army and the city of Las Vegas signed a lease for the 160-acre airstrip that was to become the Las Vegas Army

Air Field. In addition to the airfield, the Army needed a vast amount of continuous public land on which to practice. As a result, the Las Vegas Bombing and Gunnery Range, now the NAFR, was established by President Roosevelt in the last part of October 1940 (U.S. Air Force 1997). Use of the NAFR, however, was initially delayed because scattered throughout the withdrawn public land were a number of grazing allotments, homesteads, and patented mining claims. To help alleviate these problems, co-use of portions of the NAFR was granted to cattlemen and miners from 1940 until 1959 (Department of Defense 1991). Prior to the eventual compensation for the loss of privately owned lands and grazing and mineral rights within the NAFR, "most of the (privately held) land had been leased by its owners to the Air Force for $1 a year or a similar nominal figure" (McCracken 1992b:105). Although the technology has changed since the 1940s, NAFB's missions remain relatively the same. The mission management of the NAFB and NAFR lands provide for continued advanced aircrew weapons training, allows operational testing, tactics development, and evaluation of all models of combat aircraft, provides a premier battle space environment for testing and training of the highest caliber combat-ready crews, and showcases airpower to the world, efforts critical to America's national defense (NAFB 1998). The NAFR has restricted access to ensure public safety and security..

Guided by the principles of multiple use and sustained yield of resources and a recognized need to protect and enhance the natural and human environment for the benefit of the American public, the BLM manages more public domain land in Nevada than any other federal agency. Founded in 1946 as a result of a congressional merger of the General Land Office and Grazing Service, the BLM now manages generally what remains of the nation's once vast public land holdings (Muhn and Stuart 1988). The BLM's current mission is to sustain the health, diversity, and productivity of the public lands it administers for the use and enjoyment of present and future generations through a multiple-use strategy while maintaining such lands to be open and free from restricted access (White 1998b). The BLM administers livestock grazing, timber and mineral resources, cultural resources, and recreation. In addition to public land managed by the BLM, Ely District, to the east of the NAFR, the BLM has entered into a Memorandum of Understanding with the U.S. Air Force that permits aircraft overflights into a defined area known as the Desert Military Operations Area. Within this overflight area, military aircraft are allowed high-speed operations,

including abrupt aircraft maneuvers and supersonic flight at or above 5,000 feet above ground level (Department of Defense 1991).

4.0 FIELD METHODOLOGY

During the fieldwork phase, a variety of conventional archaeological methods were used to document the four study sites that required the completion of particular tasks to accomplish project goals (White 1998b). Petroglyph and/or pictograph site recording can be achieved as part of a three-tiered approach for this type of site, each level more detailed, labor-intensive, and time-consuming than the preceding. Level I initiates general site documentation by the completion of appropriate sections of the Nevada State Historic Preservation Office-approved Intermountain Antiquities Computer System (IMACS) Site Form. Level II includes the completion of IMACS Rock Art forms for each petroglyph/pictograph panel in addition to the standard IMACS Site Form. Aside from the completion of all IMACS forms, the Level III effort includes detailed and measured drawings of each panel. Site documentation for this study was conducted at Level II and included photography of each panel to provide baseline data for cultural resource managers. Overall site black-and-white and digital photographs were taken. Panel photographs included centimeter scales. IMACS Site Forms, IMACS Rock Art forms, and panel photographs are provided under separate cover.

Prior to site documentation, each study site was inventoried. Site inventory was accomplished by making standard linear pedestrian transects with personnel spaced at 10 m or less. Diagnostic artifacts and features were pin flagged for further recording. Petroglyph and/or pictograph panels were identified according to previous site inventories, where applicable. Once located, panels were marked with a length of survey flagging held in place by a small piece of painter's masking tape (painter's masking tape is less likely to leave a residue on the rock surface). Each marker was carefully placed away from any design elements but attached where the panel could be easily seen. Panel flagging was left in place until the last step of panel documentation was completed. Where appropriate, previous panel designations were re-used to catalog panels, and new designations were applied in alphabetical order as appropriate. In some cases, new panels were identified that had been missed in previous inventories, and an alphabet letter with a sub-number designation was applied. Individual crewmembers were responsible for filling out IMACS Rock Art recording forms for panels they worked on as well as completing an individual Site Condition Recording Form to record human-caused site impacts (White 1998b). A Munsell color chart was

used to record the general color differences between the patinated background of the natural rock face and the color of the petroglyph elements.

Site mapping was initially undertaken using a Topcon GTS-121 electronic total station from a selected site datum. Due to the topographic complexity of the canyon sites, however, measured drawings were made in order to develop more realistic maps after it was determined that the collected Total Station data was insufficient. Included on site maps are prominent topographic and/or archaeological features, petroglyph and pictograph panel locations, subsurface probe locations, and other points deemed important to convey spatial relationships or that contribute to site interpretation.

Subsurface probes were conducted at each of the four study sites. The purpose of probing as an accepted archaeological recording process tool in Nevada is to "determine whether there is visible subsurface stratigraphic deposition on the site" and is not to "simply determine whether there are artifacts that have percolated down through the soil" (Myhrer 1998). Probe locations were determined in consultation between the Principal Investigator and the project's geomorphologist. The geomorphologist performed observations of the probes, conducted in 10-centimeter (cm) levels, to determine the presence of stratigraphy and the potential of intact subsurface cultural deposits prior to backfilling. Removed soil was screened through 1/8-inch mesh, and the type and material of observed artifacts was categorized. Noted artifacts were bagged in zip-lock bags by level and reburied at the bottom of the probe unit, this being a non-collection project. Each probe was 50 by 50 cm square, with two exceptions. At the White River Narrows Loci I and III, two 50 cm by 1 m probe units were allowed in consultation with the BLM archaeologist, Mark Henderson.

Although primarily a non-collection project, the collection of specific artifacts was allowed as long as the collection contributed to project objectives. In this study, collected material was limited to diagnostic obsidian artifacts that had the potential for standard obsidian hydration and sourcing as well as charcoal recovered from potential hearth features for use in standard radiocarbon analysis. Once gathered, justifications for their collection were submitted to the NAFB archaeologist, Keith Myhrer. Native American field observers, Gaylene Moose and Lalove Miller, were also allowed the opportunity to view and handle the obsidian artifacts and explained the purpose of their collection. The obsidian artifacts were, however, not analyzed due to Native

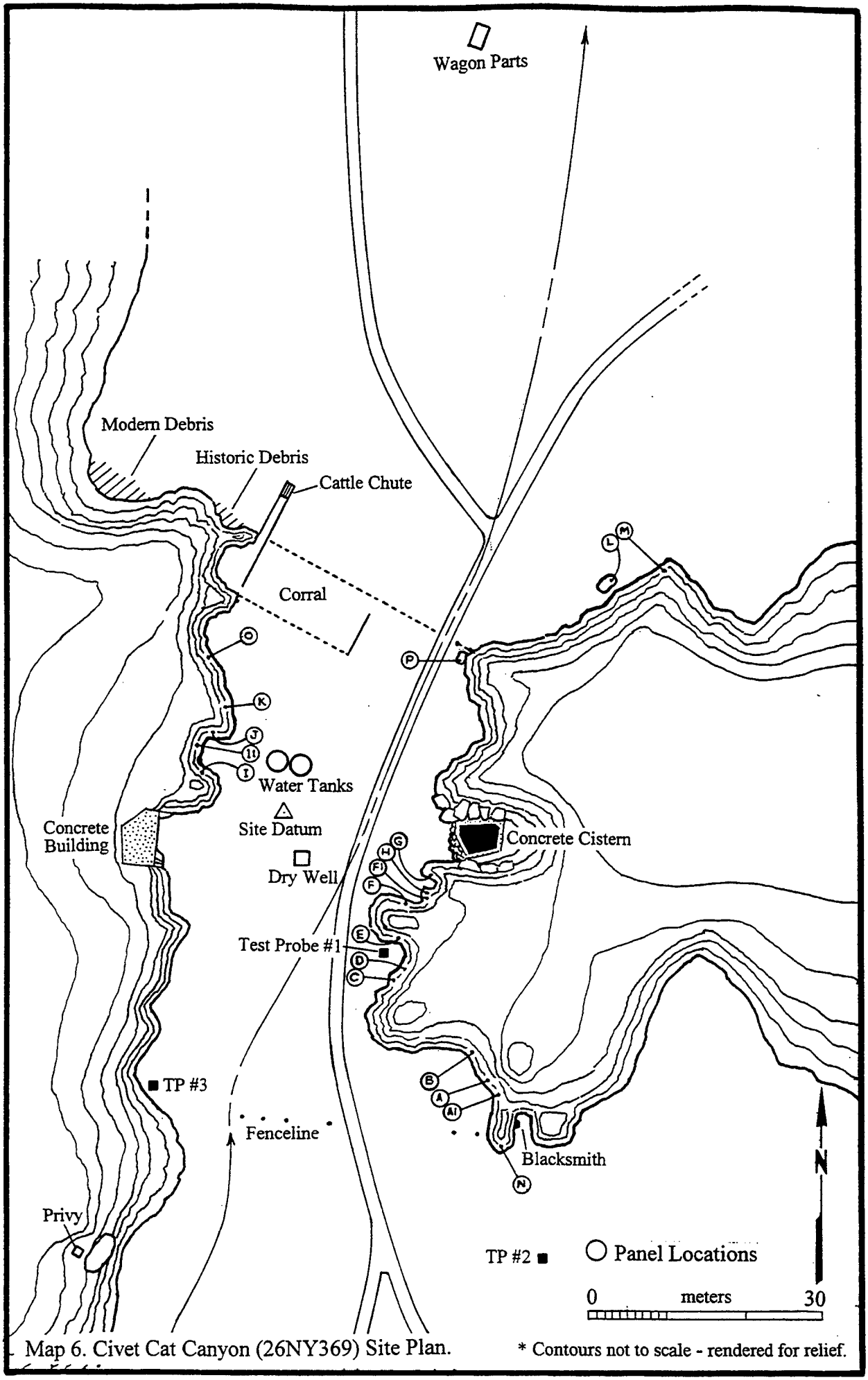
American objections to the hydration and sourcing process. It was later felt by the participating Native Americans that "subjecting the artifacts to analysis was not worth the cost in terms of data to be received versus impacting the spiritual context" (Myher 1999a:3). All artifacts were later returned to their point of collection.

5.0 STUDY SITES

5.1 CIVET CAT CANYON (26NY369)

Situated in a natural constriction at the juncture of two north-flowing drainage washes with 3 to 5 m-high vertical walls of patinated welded tuff, the Civet Cat Cave or Canyon site is a multi-component cultural resource containing both prehistoric and historic/modern cultural manifestations (Map 6; Photographs 1 and 2). Prehistoric evidence includes a very sparse lithic scatter and petroglyph panels. Although there are 19 petroglyph panels at this site, at least three of the panels contain only historic/modern inscriptions, while the remainder are prehistoric in origin or contain both historic/modern and prehistoric elements. Natural alcoves and two concavities in the canyon's walls offer protection from the elements and were previously reported as rockshelters (York *et al.* 1996); however, no evidence of human occupation (i.e., smoke-blackened ceilings, artifacts, middens) was observed during the current project. Recorded historic material remains, dating from the turn of the century to the 1940s, include ranching and military-related features, a refuse concentration, and a general scattering of debris including wagon parts. Modern material remains include fragmented inert bomb components of undetermined age, a few tin cans with labels, and the tailgate of a 1960s Ford truck. A wooden building may have existed on the west terrace but was likely torn down and partially buried at the site's northwest corner. This assumption is supported by Bergin (1979:61), who states that "one historic structure has been cleared away and replaced by two trucks." The site has been disturbed by military activity. Inert bomb and large-caliber ordnance impacts possibly resulted while the site may have been used as military target 71-4 before its deactivation in the late 1970s (Crownover 1981; York *et al.* 1996). Some confusion exists over this aspect, however (refer to Section 7.1 below).

Some petroglyph elements from this site were included in Heizer and Baumhoff's (1962:57) classic analysis. Unfortunately, the two researchers equate Steward's (1929:146) study site number 220 as being the Civet Cat Canyon location, not realizing that Steward's 220 is actually at the former Gold Crater mining camp 2 to 3 miles southwest of this site. Heizer and Baumhoff additionally apply the site number of NY-3 to this site in their work, when actually 26NY3 is recorded as



Map 6. Civet Cat Canyon (26NY369) Site Plan.

Photograph 1. Civet Cat Canyon (26NY369) Looking North/Northeast.

Photograph 2. Panel G Detail, Unusual Zoomorphic Element.

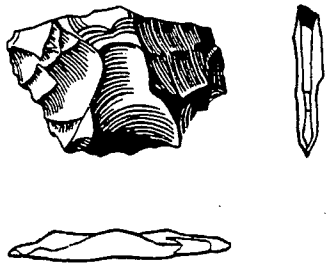
Tippipah Spring, which is far to the southeast according to archived site forms. Further discussion of the prehistoric and historic components of this site is provided below.

5.1.1 Prehistoric Lithics

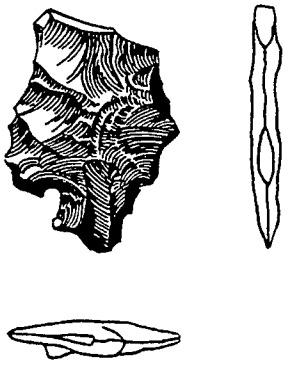
Approximately 15 pieces of lithic debitage, two projectile point fragments, and a biface characterize the sparse prehistoric lithic material identified at this site. Lithic materials were generally scattered in the canyon and on the opposing welded tuff terraces above the wash floor. Situated north of and adjacent to the corral, a proximal end of a Gatecliff Contracting Stem projectile point fragment was identified. The artifact was manufactured from obsidian and was made utilizing soft hammer percussion. Pressure flaking to the hafting element and to the regular bifacial margins was executed later (Figure 1A). It was. A second obsidian projectile point fragment was identified as a portion of an Elko-Eared or Corner-Notched point (Figure 1B). It was situated at the base of petroglyph Panel F. Both point fragments were collected for potential obsidian hydration and sourcing. A Stage II biface (elongate, ovoid, with irregular bifacial margins), constructed of a red-brown, semi-translucent chert, was also identified. The artifact was observed on the west terrace above the corral and contains a production break on one end resulting from a vug or cleavage plane in the stone material. Other than the three described tools, the site's lithic component consists primarily of chert and obsidian core reduction flakes. A previously identified lithic scatter was situated at the site's southwestern margin (York *et al.* 1996). Reassessment of the scatter determined that the material resulted from natural impacts in the active drainage channel rather than human activity. Based on lithic reduction information, it can be stated that previously manufactured formal tools and large, curated flakes were transported to the site from lithic procurement and production areas, and major lithic reduction activities did not occur at this site.

5.1.2 Petroglyph Panels

All discussed panels have been photographed and sketched for recording purposes; only a representative sample are illustrated in the text. To better understand panel descriptions, refer to



A. Gatecliff Contracting Stem



B. Elko-Eared or Corner Notched

Figure 1. Obsidian Lithic Tools from Civet Cat Canyon (Actual Size).

the corresponding panel photographs in Appendix C. Design element types, the number of occurrences, and the distribution of element types by site are presented in Appendix A.

Panel A: Situated at the southeast corner of the site and facing southwest, Panel A consists of both prehistoric and historic elements. In descending arrangement, dates and names from the historic period are scratched into the welded tuff cliff face and include "1947 / EM BOOTH / 1929 / MABELE BOOTH / RAMONO ANN." A single prehistoric element consisting of a solid-pecked rake element with three down-turned tines is found below the names and dates.

Panel A-1: Two solid-pecked prehistoric elements are situated to the left of Panel A. The panel consists of a character best described as the letter "V," and farther right is a small arch, or a lazy "C"-like element. From variation in patination, the arch appears more recent in age than the "V," suggesting two separate petroglyph events.

Panel B: Scratched but primarily pecked prehistoric elements occur on this panel (Figure 2). In the upper right-hand portion of the panel, two separate sets of three vertical parallel lines and a separate single diagonal line have been scratched into the rock face. The most obvious element is a single-pecked horizontal line that includes a wavy section in the central segment. Three separate circles, a short vertical line, and a "V"-like element are pecked above the horizontal line. At the left end of this primary line is a figure thought to represent a partial anthropomorph. Extending continuously downward from the anthropomorph diagonally and directly underneath the primary horizontal line is a complex curvilinear and rectilinear line design element. At the lower right-hand portion of the panel, the design's various extensions terminate in two rayed circles and an arch. Two separate circles are also associated with the lower expression. Probably created at different episodes, the pecked curvilinear elements of this panel are of a single composition, the scratching having been added later. A large-caliber impact mark is present in the upper portion of this panel.

Panel C: Both modern/historic and prehistoric elements are depicted on this panel. The initials "J.R.I." are lightly pecked, and undecipherable block letters have been scratched into the panel face. Pecked prehistoric elements grouped together include three crosses, one with a down-turned cross-arm toward its left end and one with an upturned left cross-arm, two horizontal parallel wavy lines over a short horizontal wavy line, a circle, a short vertical wavy line, and a half-rayed

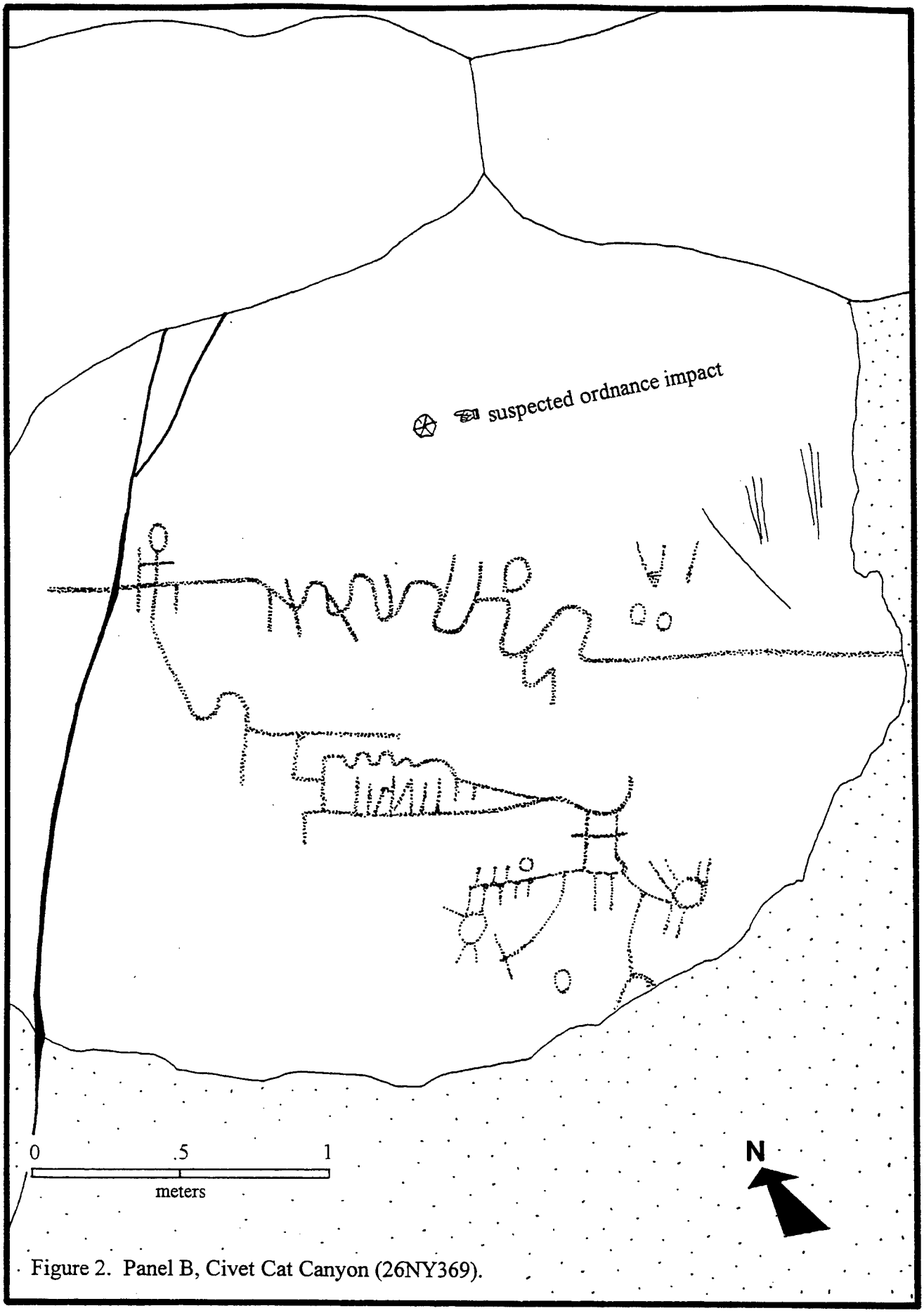


Figure 2. Panel B, Civet Cat Canyon (26NY369).

circle encompassing a natural spall. Scratched prehistoric elements grouped together include two figure eights, two separate short vertical lines, two vertical wavy line segments joining to form a single vertical line, and a "U"-like element terminating in a circle. Random stipple-pecked characters include a circle, a tailed circle, and a vertical line. Based on variation in patination, a minimum of four episodes of petroglyph creation exists on this panel, two prehistoric and two historic/modern expressions. A single, large-caliber impact mark is present on the lower right-hand panel corner.

Panel D: Situated above the wash channel on a small outcrop ledge situated on the east side of the canyon, Panel D is composed entirely of prehistoric elements. Beginning on the left panel side is a tailed cross whose tail has a short bend to the right before continuing its downward trend. To the right of the cross is a short diagonal line, a rayed circle with three rays, and a vertical line followed by a short, wavy horizontal line. Above and diagonally to this last element is a wavy line followed by a curvilinear cross, another short wavy line, a vertical line with two horizontal dividing lines, and a separate concave arch. On the panel's right side is a long curvilinear line extending upwards, arching over, then turning downwards, with the left leg shorter than the right. All of the elements depicted on this panel appear to be the same relative age based on equal repatination and probably represent a single event and composition.

Panel E: Directly adjacent to Panel D at the same level, the elements of Panel E appear to be of the same relative age and may have been created by the same person as the previous panel. Two prehistoric elements, consisting of a stick anthropomorph and a curvilinear line extending diagonally for approximately 37 cm, decorate the panel face. The only definitive anthropomorph at this site, it has two short legs, slightly curvilinear arms extending horizontally outward for a total reach of 57 cm, stands approximately 70 cm high, and is topped by headware similar in appearance to an old-fashioned sailor's hat or beret with a tassel. A single, large-caliber impact mark is noted on the lower portion of the panel.

Panel F: Panel F is a north-facing panel situated on the east side of the canyon. It is at the entrance to an alcove currently occupied by a historic rock and concrete water tank feature. Panel F contains both modern/historic and prehistoric petroglyph elements. At the base of the panel are four solid-pecked parallel lines, each 5 cm in length. Above and to the right is a long, pecked stipple

vertical curvilinear alignment terminating in two looped interconnecting lines. A small area of stipple pecking is just to the left of the looped lines. The prehistoric elements appear to be of the same relative age based on little difference in patination. Scratched into the face are the initials "GH." A larger "H" is also scratched above and to the right of the small initials.

Panel F-1: A single, solid-pecked curvilinear line extending horizontally is the only petroglyph element represented on this panel. It is situated above the ground surface and accessed by a small ledge. A weathered and damaged 25-pound inert practice bomb has impacted the panel and is wedged into a natural crack at the juncture of two opposing rock faces to the right of the element.

Panel G: Panel G represents at least three episodes of creation and is by far the most complex petroglyph panel at this site. Both modern/historic and prehistoric petroglyph design elements are present (Figure 3). Modern/historic activity includes the pecked initials and date of "D.C.S. / 7.14.17" as well as the scratched initials "LRO" and numbers "196" (possibly a year) on the upper portion of the panel. Below is a separate circle and four roughly parallel horizontal wavy lines of various lengths and wave intensity that are prehistoric in age. To the right of the wavy lines is a pecked circle and a vertical atlatl depiction, suggesting an Archaic time period. Separated by a crack in the boulder, the lower portion of the panel contains the initials and date of "SJS" and possibly "85" or "65." The initials are partially superimposed over a single, short horizontal line separating three vertical wavy lines on the top and four similar vertical wavy lines on the bottom. On the left edge of the boulder are two bighorn sheep stick-figure representations, a vertical wavy line terminated by two horizontal lines at its base, a tailed circle, and a pecked curvilinear line element with several extensions. Directly above this is a small pocket of older-appearing, darker patinated elements comprising two parallel vertical lines opposite a bisected tailed circle. A complex interconnected curvilinear design element consisting of parallel wavy lines, a horizontal line with down-turned arches, connected circles, and general undulating lines are in the upper right-hand section of the lower portion of the panel. Below and just above the ground surface is a zoomorph of unknown identity. It appears to have a scorpion clutched in its front appendages and is slightly raised on its rear legs, having a bushy tail (Photograph 2).

Panel H: Panel H consists of both modern/historic and prehistoric petroglyph elements. The

Figure 3. Panel G, Civet Cat Canyon (26NY369).

most obvious element on this panel is that of a cow's head in frontal view, depicted with down-turned horns. It is superimposed on a lightly pecked vertical wavy line. To the left of the cow's face is a tailed circle, and to the left is another vertical wavy line terminating at its top with a solid-pecked oval, possibly representing a snake. Above the left cow horn is a single-pecked circle. Below the cow face is a lightly pecked circle resting inside a semicircle. In addition, two nested "L"-shaped elements are situated on a rock resting at the base of the panel, being fragmented from the larger panel.

Panel I: Scratched, stipple- and solid-pecked elements are illustrated on this panel, which is on the west side of the canyon narrows. A single, solid-pecked "T"-like element has been placed at the top of the panel. The lower portion of the panel contains a small, hourglass-like element in outline resting on its side and a scratch mark shaped like a vertical hairpin. Several curvilinear elements are present that at one time extended beyond the current rock edge, which has since broken off. Lying at the base of the panel is at least one rock fragment that contains missing element portions. Additional light scratching consisting of vertical and diagonal lines occurs on the left portion of the panel. All of the elements appear to be of the same relative age through equal repatination.

Panel I-1: Immediately right of the previous panel, Panel I-1 consists of five prehistoric elements. They appear to be of equal repatination, suggesting the same relative age. The upper element consists of a concave arched line with either end turning downward and having a short, hooked line extending upward from the center of the concave arch. Lower and to the right is a single, short, vertical line. Farther below is a short horizontal line with two parallel downturned tines at the right side. Directly below this character are two tailed circles, with both tails extending downward.

Panel J: Continuing north along the cliff face of the west terrace are two prehistoric elements situated near ground level on a small, vertical, south-facing rock facade. The upper element consists of a single, short, vertical, stipple-pecked line. Below this is a single, stipple-pecked circle approximately 8 cm in diameter. Both elements, equal in patination color, appear to be of the same relative age.

Panel K: Elements on Panel K consist of historic dates and scratching. Stipple-pecked dates

on the panel include "AUG 1, 1932" and "1908." The number "12" appears below the latter date and may have been intended to represent the month of December. "X"-type scratches are associated with diamond-shaped elements between the two historic dates.

Panel L: Panel L is on a boulder at the northeastern end of the site. The single element, approximately 18 cm in length, consists of a solid-pecked diagonal line with a circle attached at the lower right third.

Panel M: Directly across from the previous panel and pecked into the cliff face are two roughly parallel solid-pecked lines, one line slightly longer than the other.

Panel N: Depicted on Panel N are the letters UF. A 1/2-inch-wide chisel may have been used to create the letters.

Panel O: This panel contains a person's name, "TIM," which is scratched into the cliff face on the west side of the canyon.

Panel P: A single, curvilinear pecked line meandering horizontally decorates this panel. Attached to the left end of the line is another short vertical line. The prehistoric element is at the base of the cliff face near the northeastern end of the site. Adjacent to the panel is a rolled and riveted pipe used historically as a fence post. This small glyph was identified by two Native American participants after being overlooked by the HRC recording crew.

5.1.3 Historic Component

The historic components of this site consists of a concrete and rock storage (bunker) structure, a concrete and rock cistern, two metal stock tanks, a privy pit, a blacksmithing area, a partially concrete and rock-lined dry well shaft, and a corral with a livestock chute. Historic artifacts are spread across the site in a random fashion with a few areas of concentration. It is thought that some of the artifacts and features are associated with a line camp or small ranching operation, while other features are suspected of being related to WWII military activities.

Feature 1: Corral. Situated at the northwestern end of the canyon constriction, the stock corral represents the site's largest and most visible historic feature (Figure 4). The corral enclosure

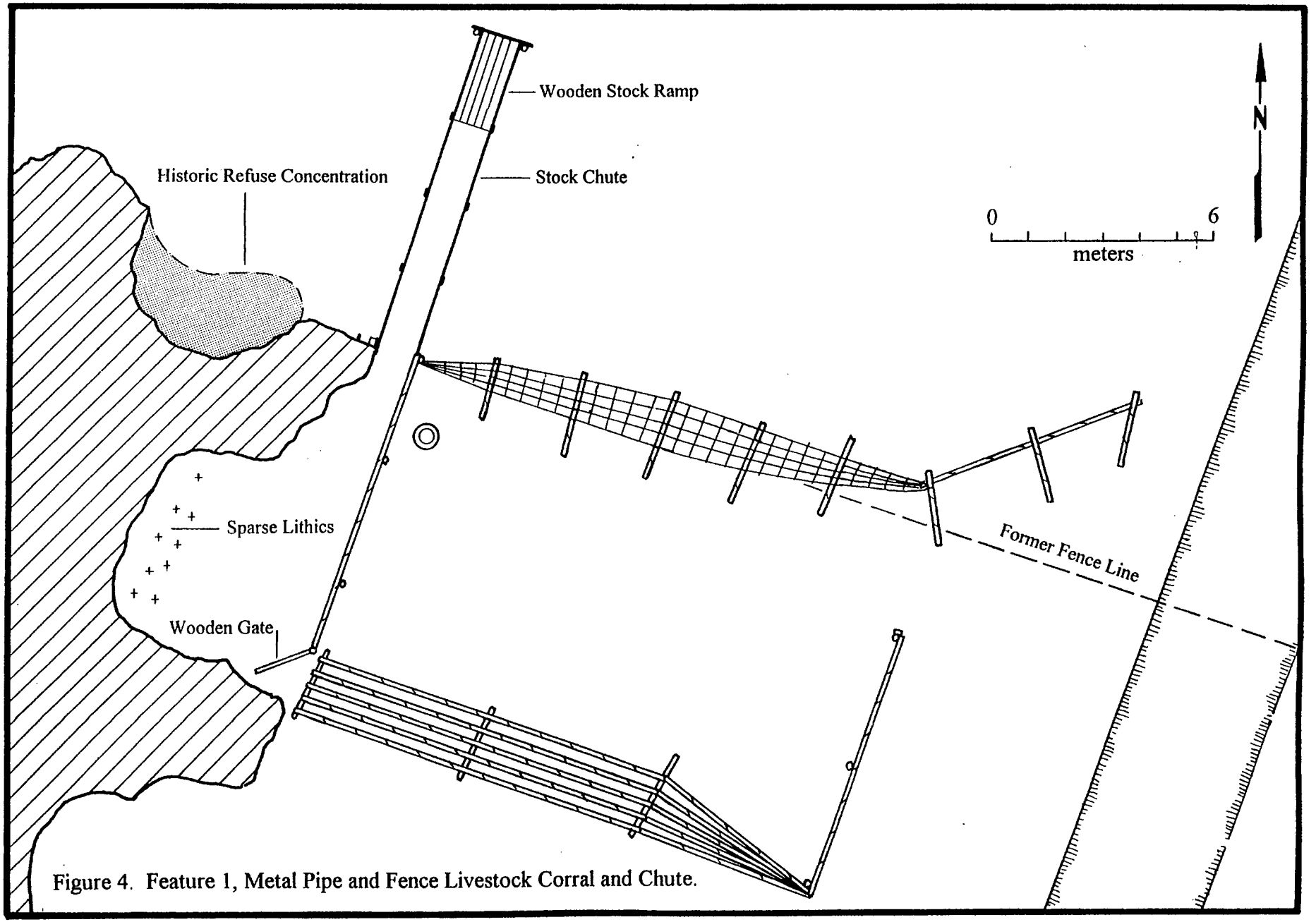
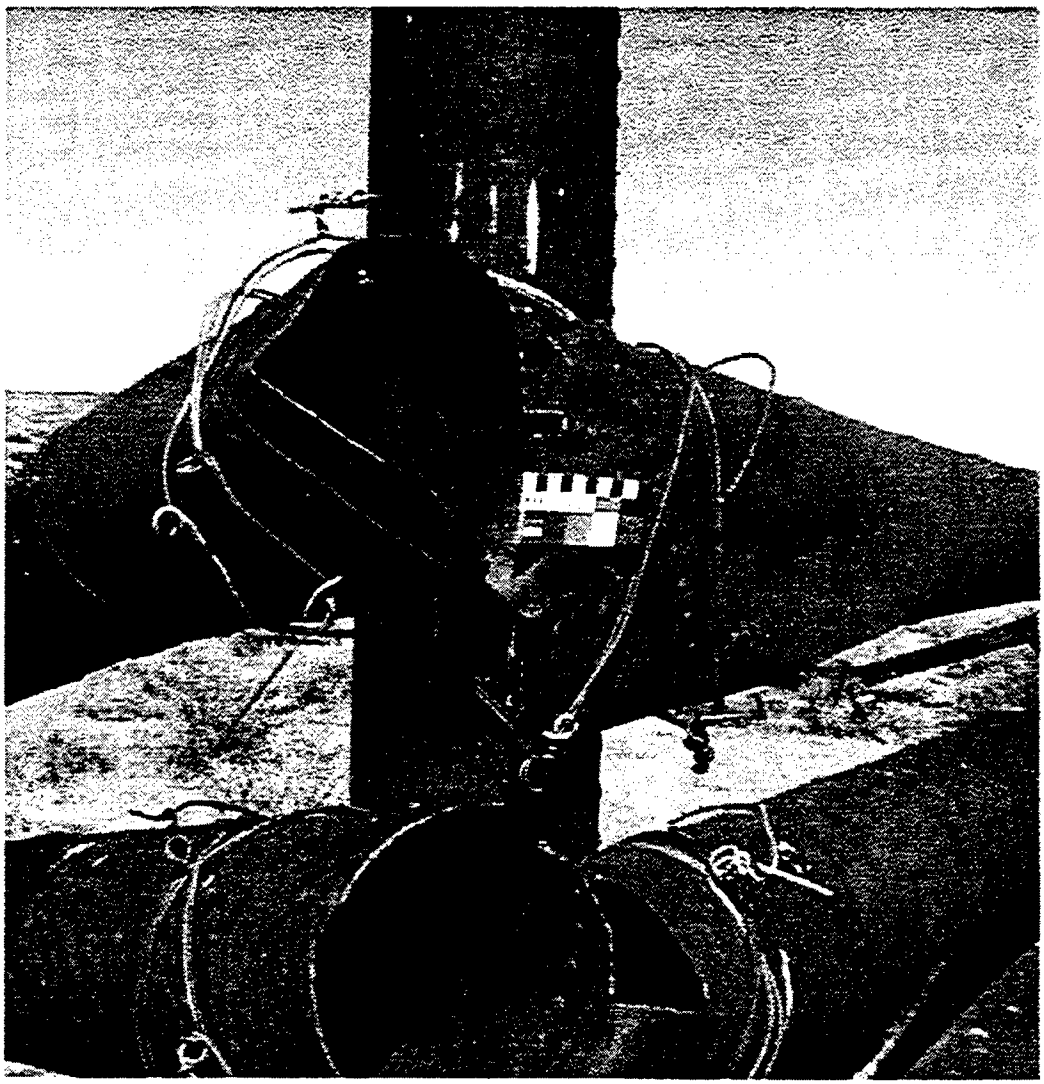


Figure 4. Feature 1, Metal Pipe and Fence Livestock Corral and Chute.



Photograph 3. Southeast Corner of Corral, Feature 1.

measures 35.5 feet on the east-west side, 50 feet on the north-south side, and has a livestock chute and loading ramp 28.5 feet long by 3.5 feet wide. Unlike most corrals observed in Nevada, which are constructed of milled lumber and/or railroad ties, the post and rails of this unique corral are constructed primarily of 6.5-inch-diameter water pipe (Photograph 3). The pipe sections were originally manufactured by wrapping 12-inch-wide by 3/16-inch-thick iron in spiral fashion with an overlap of 1.5 inches. Overlapping wrap joints were then drilled with .25-inch holes every 1.25 inches along the joint. Metal rivets were inserted in the drilled holes and both the internal and external ends conically flattened to a width of 3/8 inch. Where individual lengths of pipe were jointed, one end was inserted inside a slightly larger diameter end to an unknown depth and was secured with a 2-inch-wide metal strap band tightened and held in place by a 3/8-inch-diameter by 2-inch-long bolt with nut.

With the western cliff face and an alcove used as part of the stock-enclosing system, the corral was haphazardly constructed. For the most part, the above-described pipe was used as both corral posts and rails, with some exceptions. Posts varied in height above the ground surface. On the east, south, and west corral sides, lengths of pipe were stacked horizontally five rails high to a height of 6 feet with random space between the rails. At the corner posts, the rails were secured by the use of heavy-gauge wire wrapped in a figure-eight configuration and occasionally attached by welding a deliberately cut tongue of metal onto a corresponding corner rail. On the north side, galvanized fencing with 6- by 6-inch-square openings was secured to a single top rail and five posts, with the height of the fence being 4 feet. At one time, the northern fence continued across to the eastern cliff face in order to partition off the north section of the constriction. Wooden corral gates were situated at the northeast and southwest corners of the corral, the southwestern gate opening into the loading chute and ramp area. The chute and ramp were constructed of 2- by 12-inch milled lumber to a height of 5 feet, rails secured to cedar posts, and the floor of the ramp was constructed of used railroad ties. Partial and complete collapse has occurred on the south and north corral sides. The pipe for the construction of this corral may have been recycled from Tule Canyon, once serving the gold mines and village of Gold Mountain (circa 1881 [David Valentine 1998, personal communication; Paher 1984]).

Feature 2: Concrete Water Tank. Feature 2 represents a water tank constructed of rock and

concrete built into a natural depression and short drainage channel cutting into the eastern cliff face (Figure 5). Rocks were mortared into place to form the western end of the multi-sided structure. Corrugated metal was used as an internal construction form when the south walls of the tank were poured. Wall thickness varies from 6 inches to 1 foot. In some places, a thin coat of mortar veneer was troweled over the interior concrete wall, which contains a high percentage of gravel. Generally, the tank measures 15 feet long, 10 feet wide, and 4 feet deep, having a storage capacity of approximately 3,000± gallons of water. Inscribed into the top concrete edge on the east side is the figure "40" (probably for 1940). Upslope from the tank is a wooden fence that is variously constructed of railroad tie posts, milled lumber, and telegraph pole cross-arms used as rails. The function of the fence was to keep animals from accessing the tank at the uphill side. The telegraph cross-arms still retain their threaded metal insulator posts. A 1-inch-diameter pipe was observed in the concrete floor and probably acted as a drain. A 1-inch-diameter pipe was also observed outside the tank, partially buried in the ground, and may at one time have supplied water to the tank or permitted water to flow from the tank to some other location.

Feature 3: Metal Stock Tanks. Feature 3 consists of a pair of side-by-side stock tanks for water storage. Both tanks are 10 feet in diameter and stand 2 feet high. Each tank has a 4-inch slab of concrete, which acts as the base for the tank's galvanized metal sides.

Feature 4: Well. Those who dug into the sand and gravels of the wash in a futile effort to reach the water table stabilized the upper portion of this well shaft by constructing rock and concrete walls. Walls of this structure vary in thickness from 12 to 19 inches and are generally exposed 2 feet above the ground surface. With wooden boards being used as construction forms on the interior of the opening, the concrete was poured to a depth of 7.5 feet; the opening is 5 by 7 feet. The bottom of the well is currently 31 feet below the top edge, and the earthen sides are collapsing, undercutting the concrete structure. Removed soil has been spread across the site rather than heaped into a pile.

Feature 5: Concrete Storage (Bunker) Structure. Totally enclosing a former natural rock alcove (Civet Cat Cave) in the site's west cliff face, Feature 5 consists of a concrete storage structure (Figure 6). Measuring 20.5 feet across the front and 30 feet from the doorway to the irregular back wall, the structure has a rock and concrete entrance wall 16 inches thick with a reinforced concrete

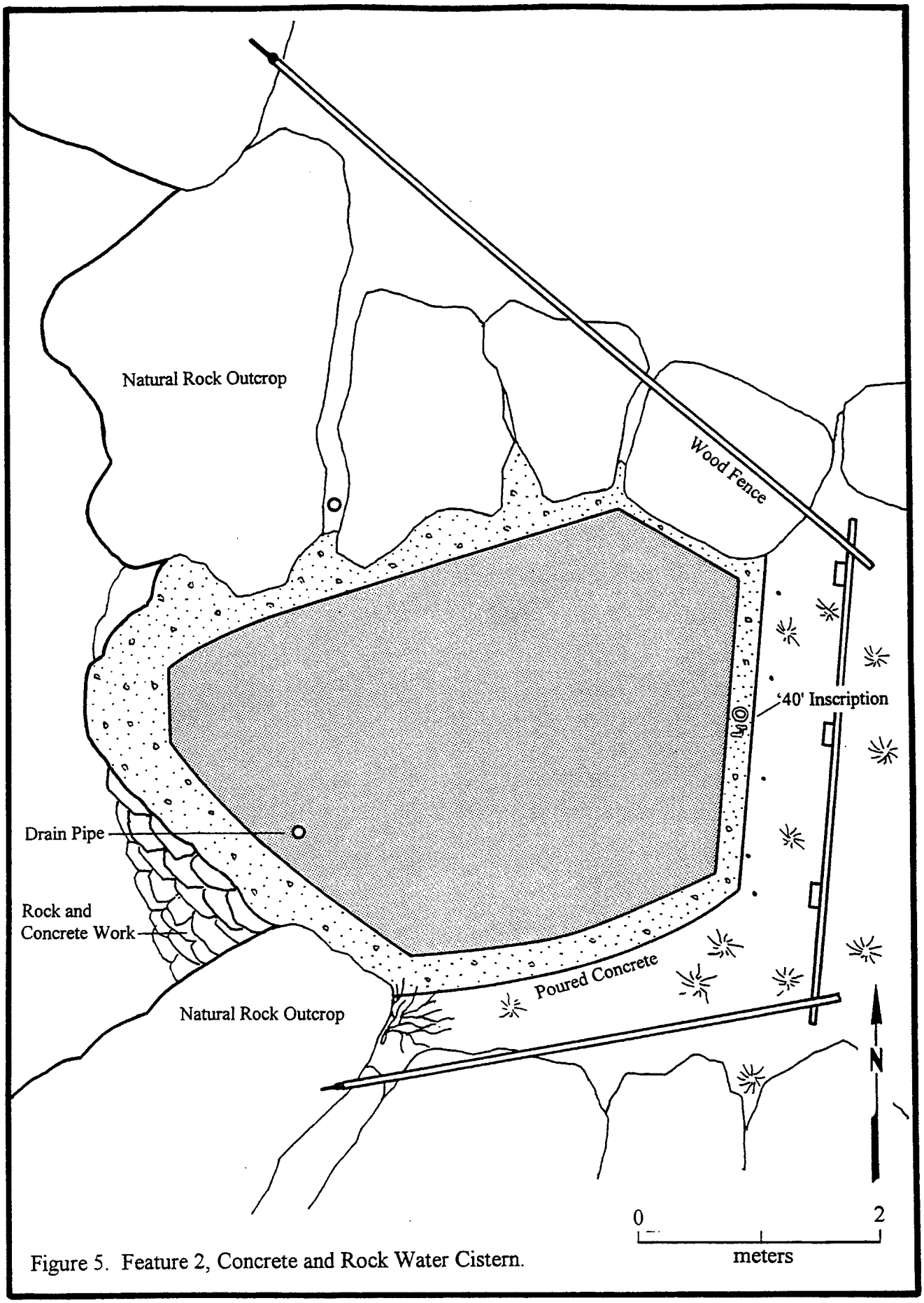


Figure 5. Feature 2, Concrete and Rock Water Cistern.

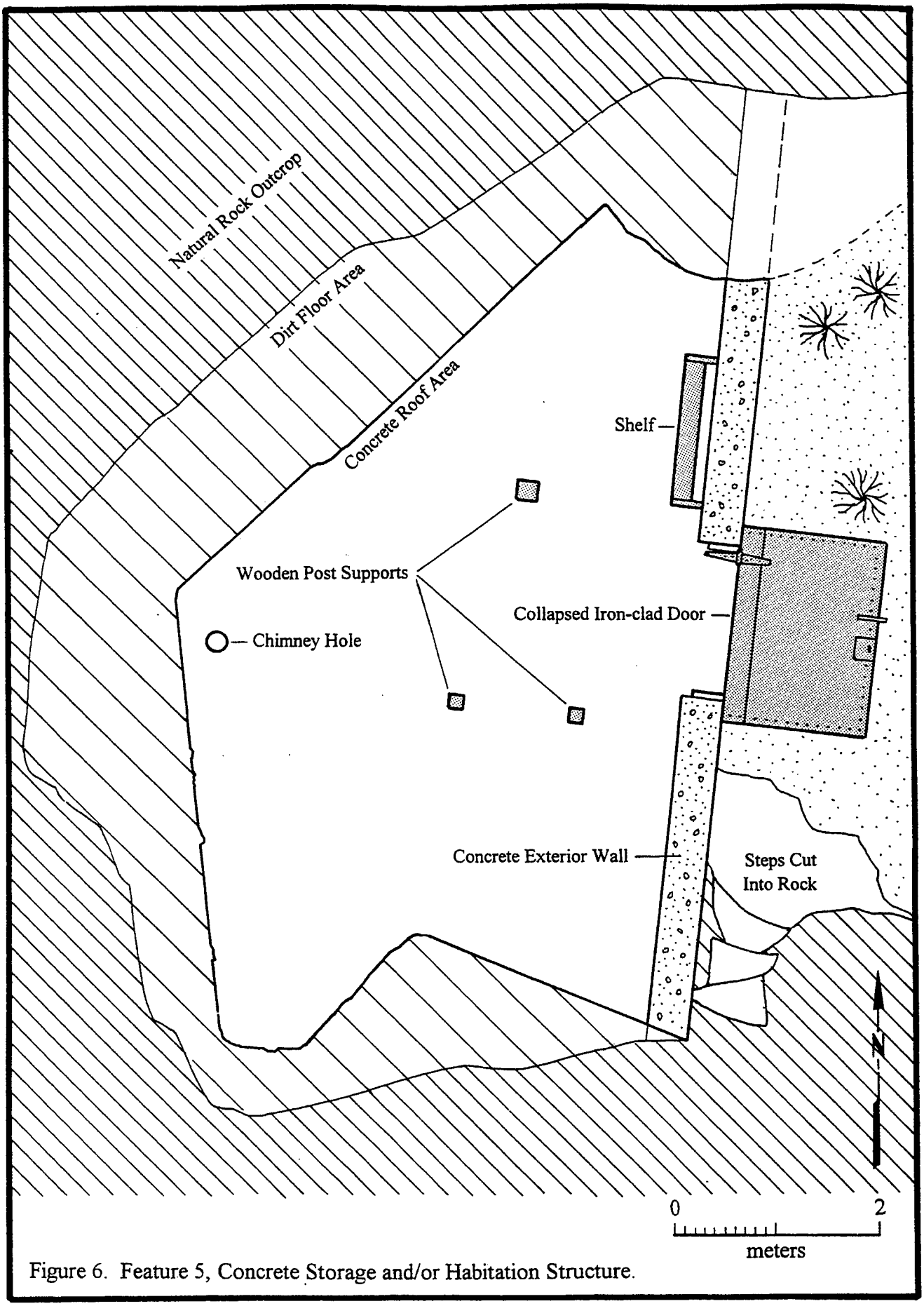


Figure 6. Feature 5, Concrete Storage and/or Habitation Structure.

roof. A slip form was probably used to cast the external wall in 22-inch levels with rock used as filler in the concrete pour. Two- by 10-inch ceiling joists spaced on 24-inch centers were irregularly supported internally by 6- by 6-inch beams wedged in holes dug into the rock face and further supported by 6- by 6-inch posts. Wide-milled lumber boards were placed on top of the joist to act as a bed upon which chain-link fence material was placed. Three-quarter-inch-diameter pipe was also used for reinforcing prior to a 4-inch-thick pour of concrete to complete the roof. Two holes penetrate the roof, one at the back and the other toward the front at the left of the doorway. These were possibly used as vent holes for stovepipes or for ventilation. Wooden jambs frame a doorway that is 4.5 feet wide by 6 feet high. The door, currently lying on the ground in front of the entrance, consists of a 2- by 4-inch frame covered by a 1/8-inch-thick metal plate formally secured to the jamb by two 12-inch strap hinges. A thin veneer of concrete was plastered over the entrance and is inscribed with the number "40," similar to Feature 2 (probably designating the year that the structure was constructed). Internally, the shelter is fitted with a cubby-hole shelf measuring 4.5 feet wide by 16 inches high supported by two floor-to-ceiling-length 2- by 8-inch boards. Externally, five steps have been carved into the face of the natural rock to the south of the entrance. This arrangement promotes easy access to the roof area and the west terrace beyond the structure.

It is likely that this concrete rock and concrete feature with an assumed 1940 construction date was the product of and related to WWII military activity on the NAFR. This feature was possibly used as a munitions bunker while the cistern, Feature 2, may have been associated with a military tent encampment at or nearby this location (Roger Christenson 1999, personal communications). It stands to reason that a rancher would not bother to make such a substantial investment in time and materials to improve this isolated location when cheaper materials such as wood would have sufficed. Based on other known ranches on the NAFR, such an endeavor by a rancher would have been atypical and not probable (Myhrer 1999a).

Feature 6: Blacksmith Area. Situated in a narrow but deep alcove at the southeastern end of the site are the remains of a blacksmith hearth (Figure 7). Built against the west rock face of the alcove, the hearth consists of numerous large rocks arranged in a C-shape 3 feet deep, 4 feet wide, and 1 foot high. Slag, small pieces of coal, and rusted metal parts including horseshoe nails are spread about the natural confines.

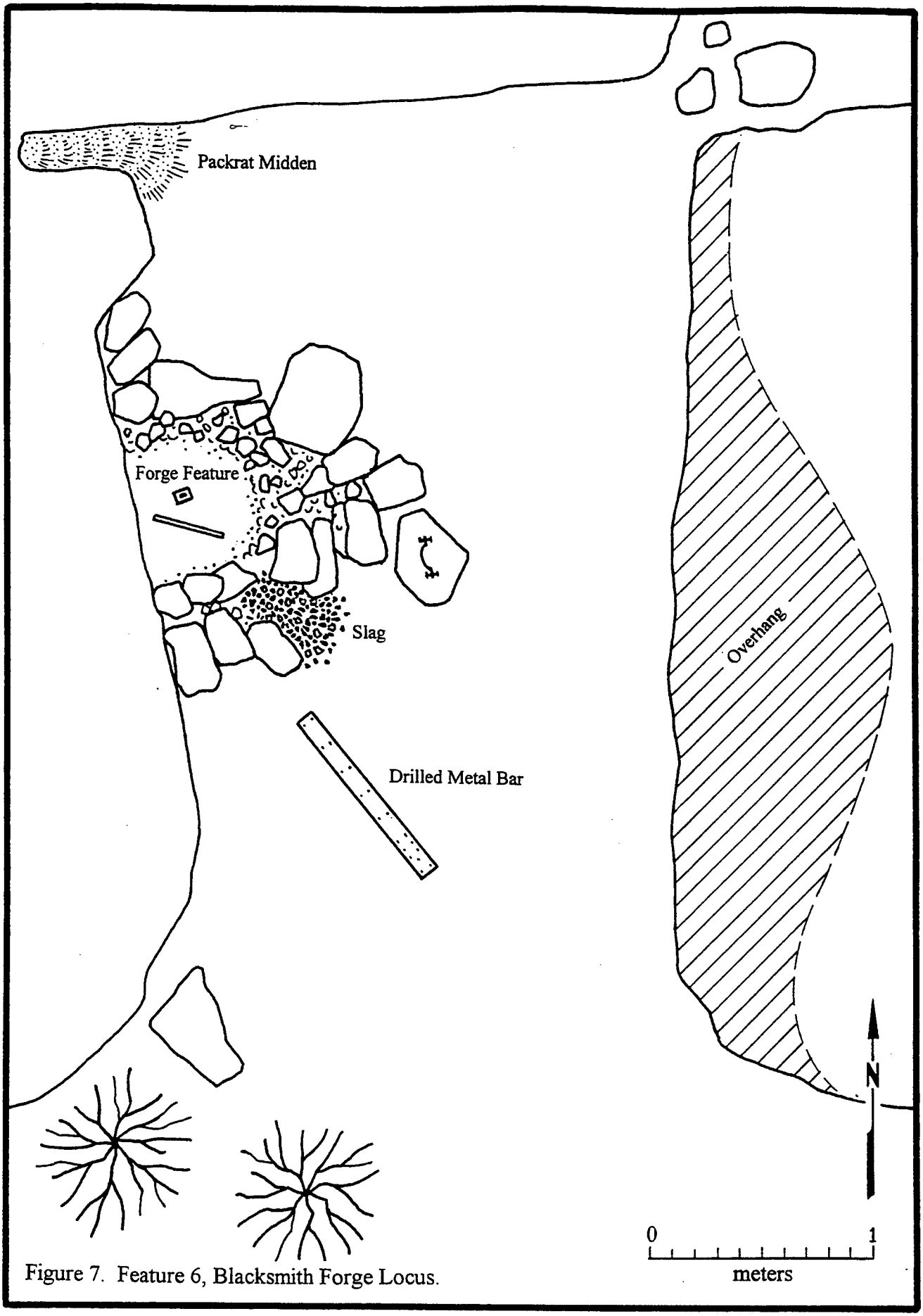


Figure 7. Feature 6, Blacksmith Forge Locus.

Feature 7: Privy. Feature 7 consists of a single privy pit with the remains of a collapsed outhouse building constructed of various sizes of 1-inch milled lumber boards (Figure 8). Hidden from view, the outhouse was tucked into a natural alcove above the wash bottom at the southwestern end of the site. The privy pit was partially dug into shallow soil and then built upwards by dry staking locally collected rocks to form a "C"-shaped 3.5- by 4-foot rock alignment set against a large outcropping of welded tuff. A wire nail was driven into the tuff on which a long strand of twisted wire was attached. The wire may have been used to secure an open door or to stabilize the outhouse during extreme wind conditions. The single seat suggests that the building was occupied by one person at a time.

Historic Artifacts. Artifacts associated with the latest activity (post-1940) and an earlier historic occupation (1900-1940) are randomly scattered about the site. One debris concentration (1900-1940) is situated at the base of the cliff face, northwestern end of the site west of the corral chute. Data related to the concentration and general artifact scatter are presented in Table 3.

5.1.4 Probe Units

Three 50- x 50-cm units were probed at separate locations within the site's boundaries. Selection of probe locations by the Principal Investigator and Geologist was based on suspected cultural deposition and accumulation or removal of sediments. Each probe was dug to a depth of 50 cm below ground surface. Again, subsurface probes were called for in the project's scope of work and are an accepted archaeological site evaluation procedure in Nevada and on the NAFR (Myhrer 1998; NAFB 1998).

Probe Unit 1. This unit was placed on the canyon floor beneath and adjacent to the southeast wall in front of a concavity large enough to have accommodated temporary human occupation. The soil profile exhibits well-defined strata deposited by the ephemeral stream; the size of the material relates directly to the energy of the depositional environment. Fine-grained material was deposited by low-magnitude flows, and coarse-grained material was deposited by higher-magnitude flows. The area of Probe Unit 1 is protected from excessive stream erosion by an upstream rock abutment that protrudes slightly outward from the wall. Fine material (silt) comprises the upper 5 cm and

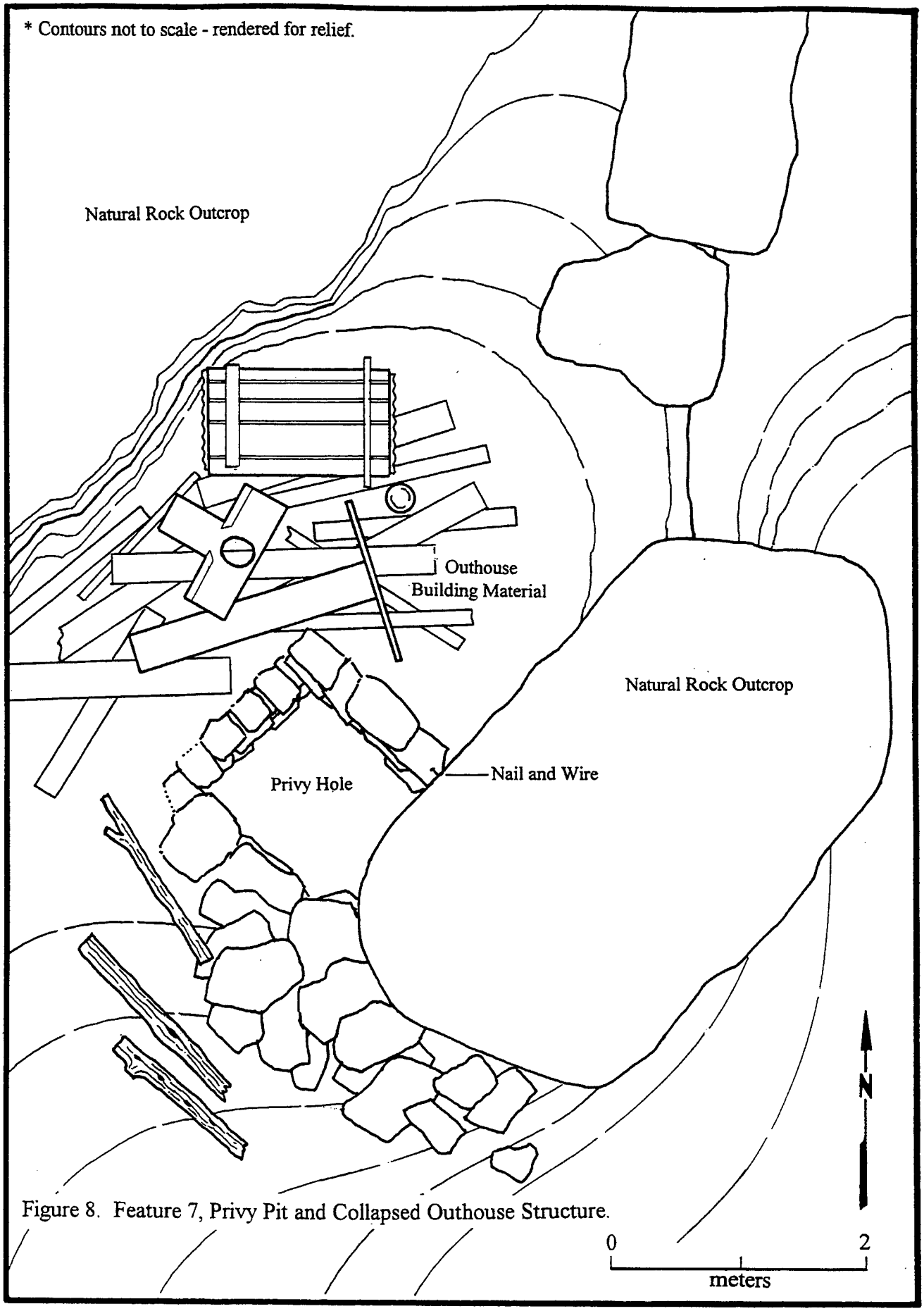


Figure 8. Feature 7, Privy Pit and Collapsed Outhouse Structure.

Table 3. Historic Artifacts Associated with Civet Cat Canyon Site (26NY369).

Page 1 of 2

Function	Type	Product or Contents	Count
CONCENTRATION			
Food	Animal	Fragmented bone, burnt and unburnt	10+
Food Container	Sanitary seam can	Fruit or Vegetable	7
Food Container	Match hole	Evaporated milk (Type 13, ca. 1917-1929)	6
Food Container	Key strip can	Rectangular meat	1
Food Container	Key strip can	Coffee	2
Food Container	Crockery	Small storage container, lid and jar fragments	3
Food Container	Bottle glass	Wide-mouth jar, clear glass	1
Food Container	Bottle glass	Aqua body fragment embossed with RADL... / a circle with an internal shield	1
Food Container	Bottle glass	Jar top (amethyst color, ca. 1880s - 1917)	1
Food Serving	Porcelain	White with thin green trim line, teacup	1
Recreation	Bottle glass	Whiskey hip flask	1
Recreation	Bottle glass	Beer bottle, crown finish (ca. 1892 to present)	1
Recreation	Friction lid can	Pocket tobacco tin	2
Recreation	Friction lid can	Cigar tin (imprinted on side QUALITY CIGARS and bottom AGTORTN 2990 / 25 / DIST PA)	1
Health	Bottle glass	Face/hand cream (white glass)	1
Household	Galvanized tin	Bucket	2
Household	Metal	Canvas grommets	5
Household	Metal	Coiled bedsprings	3
Household	Ceramic	Doorknob	1
Household	Metal	Water barrel hoops	3
Construction	Metal	Nuts and bolts	10+
Construction	Metal	Wire nails, assorted sizes	20+
Husbandry	Metal	Bailing wire	5+
Husbandry	Metal	Barbed wire, two prong, double wrapped	1
GENERAL ARTIFACT SCATTER			
Food	Animal	Eggshell	10+
Food Container	Hole-in-Top can	Evaporated milk (Type 7, ca. 1908-1914)	1
Food Container	Match hole	Evaporated milk (Type 13, ca. 1917-1929)	6
Food Container	Match hole	Evaporated milk (Type 15, ca. 1917-1929)	4
Food Container	Sanitary seam can	Fruit or vegetable, assorted sizes	8
Food Container	Key strip	Coffee (one can printed with MJB / COFFEE)	2
Food Serving	Metal	Blue enameled plate	1
Food Serving	Metal	Pie tin	1
Beverage	Bottle glass	aqua fragments (probable beer bottle glass)	20+
Beverage	Bottle glass	amber fragments (probable beer bottle glass)	20+
Beverage	Bottle glass	amethyst fragments (ca. 1880s-1917)	20+
Beverage	Bottle glass	Clear	20+

Table 3. Historic Artifacts Associated with Civet Cat Canyon Site (26NY369).
Page 2 of 2

Function	Type	Product or Contents	Count
Beverage	Bottle glass	light green (probable beer bottle glass)	20+
Communication	Glass	Glass telegraph insulator	1
Household	Metal	Bed frames	4
Household	Metal/wood	Bed springs	4
Household	Metal	Kerosene cans (secondary modification as pails)	2
Household	Metal	Galvanized buckets	4
Husbandry	Metal	Horseshoe with nails	1
Husbandry	Metal	Harness buckle	1
Husbandry	Metal	Chicken and assorted fence wires	20+
Husbandry	Metal	Windmill blades and parts	10
Construction	Metal	Assorted wire nails	20+
Construction	Metal	Corrugated tin panels	5
Construction	Wood	Assorted milled lumber boards	10
Transportation	Metal/wood	Wagon running gear	1
Transportation	Metal	Ford truck tailgate (1960s)	1
Transportation	Metal	Oil drums (modern, military)	2

is covered by loosely scattered organic debris and gravel. The next layer, 10 cm in thickness, is mostly silt with two thin, arcuate lenses of coarse sand. Beneath this is found a 10-cm layer of coarse sand and gravel that is underlain by 5 cm of silt. Following stratum, 15 cm in thickness, is a graded bed that coarsens downward; the uppermost portion is sand, and the lowest deposit is gravel. This layer pinches out to the north and east, indicating that the probe unit has captured part of an old drainage channel. A graded bed such as this forms during a flood event, wherein progressively finer material is deposited as flood magnitude decreases over time. The bottom 5 cm of this unit is silt. Stream energy involved in material transportation and deposition at this location makes it unlikely that there is a buried stable surface upon which cultural artifacts might be preserved.

Probe Unit 2. This unit was placed on a small alluvial rise at the southeast corner of the site in an area of a sparse lithic scatter. It is upstream of the canyon constriction and approximately 1 m above a very small ephemeral channel, which joins the trunk channel before it flows through the canyon. Highly disturbed by lizard and small rodent burrows, the surface is covered by loosely scattered gravel. Bedding exhibited by Probe Unit 1 is largely absent here. The upper 5 cm of Probe Unit 2 is highly disturbed, fine-grained material. Beneath this is found 35 cm of silty sand, gravel,

and cobbles. The larger clasts are subangular to subrounded in shape and vary in size up to 20 cm in diameter. The lowest 10 cm in the probe unit is rich in gravel. There are remains of fine roots throughout the pit, with a larger root visible along the northern wall. This probe unit contains poorly bedded alluvium in which there is no evidence of stable buried surfaces.

Probe Unit 3. Probe Unit 3 is situated in front of another concavity suitable for temporary human occupation. A slight rise between the southwest wall and the main ephemeral channel was selected for probing. It is upstream of the main canyon constriction and is somewhat protected from stream erosion by an upstream abutment in the wall. The surface of the unit is composed of silty sand covered by sparse organic litter. Once again, well-defined bedding is absent. Below the surface, the upper 10 cm contains silty sand and gravel (gravel clasts are uniformly small in size) with fine root activity throughout. The next 30 cm of the probe unit is made up of gravel with silty sand and cobbles, the largest of which is 10 cm in diameter; these large cobbles are relatively rare. The lowest 10 cm contains silty sand and gravel. As with the previous probes, there is no evidence of the existence of stable buried surfaces in this alluvial sequence.

5.1.5 Artifacts Noted During Probes

Several historic artifacts were encountered at each of the subsurface probes for this site; all artifacts were reburied at the bottom of their appropriate probes. Artifacts noted in Probe Unit 1 included: 0-10-cm level, one 1/2-inch-long segment of a wood screw; 10-20-cm level, a wire nail, a short length metal strapping, and 3 opalized bottle glass fragments; 20-30-cm level, 3 wire nails and 5 opalized bottle glass shards; and 30-40-cm level, eggshell fragments. Probe Unit 2 contained a horseshoe nail, 2 milled lumber fragments, and 2 wire nails in the 0-10-cm level, with nothing occurring below the upper level. Probe Unit 3 artifacts consisted of a clear bottle glass fragment, a distorted 50-caliber slug, and a small piece of charcoal in the 0-10-cm level, with no additional material noted below this initial level. Prehistoric material was not observed in any of the probe units at this site.

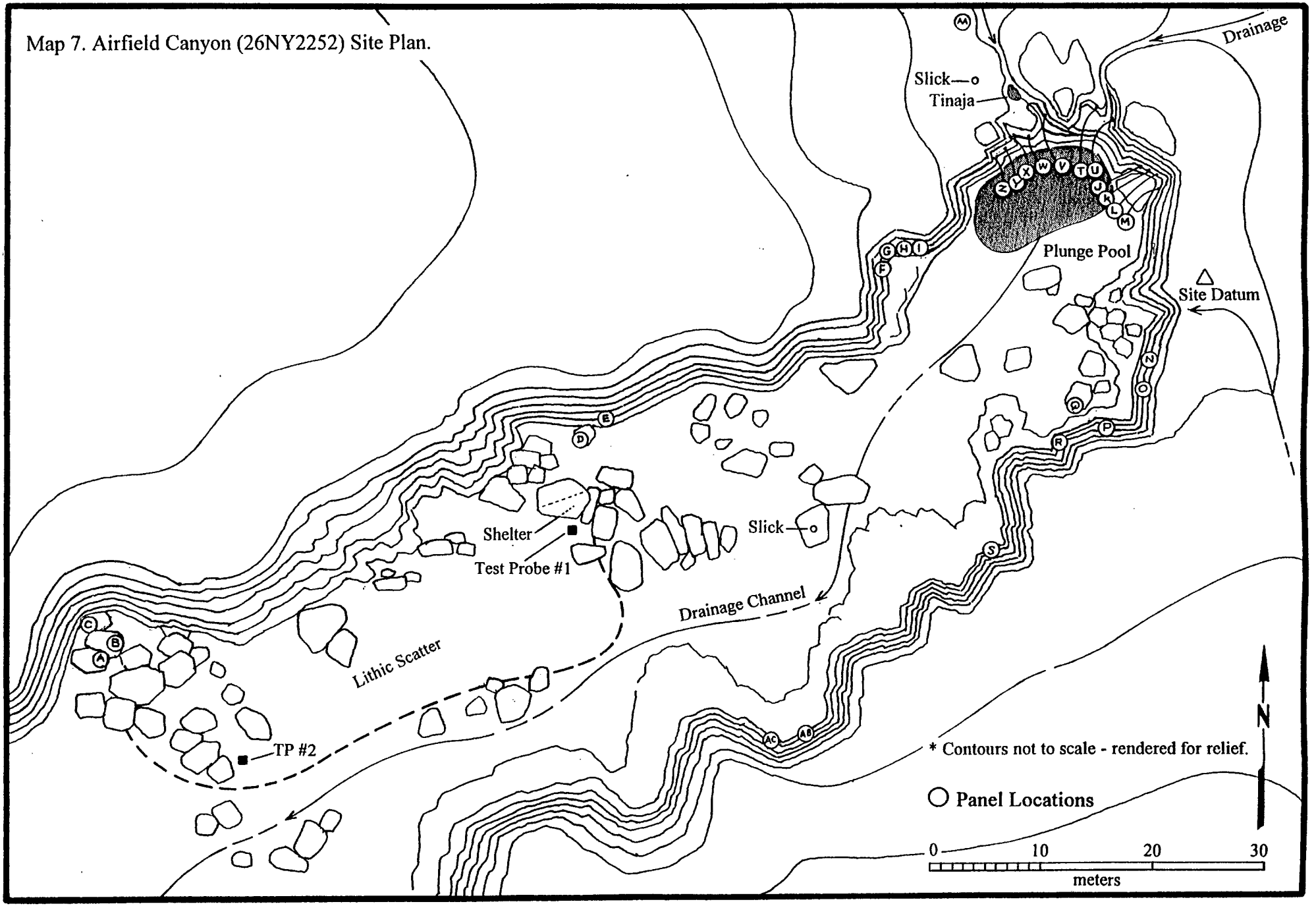
5.2 AIRFIELD CANYON (26NY2252)

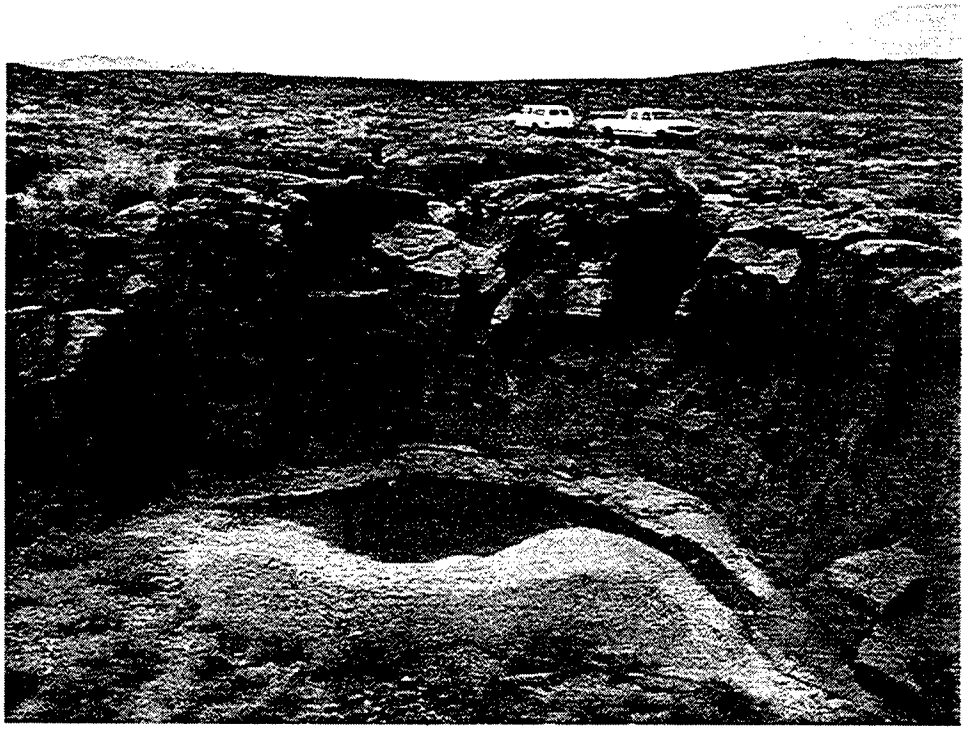
The Airfield Canyon site is at the head of an east- to west-trending box canyon with walls of welded tuff raising 5 to 6 m above the canyon floor (Map 7; Photographs 4 and 5). It received its name because of its proximity to a mock airfield used as a bombing target. Site materials consist of an extensive obsidian lithic scatter, a rockshelter, a few protected alcoves with evidence of chipping concentrations or stations, 2 bedrock milling slicks, numerous fragmented obsidian and 2 ground stone tools, and 29 petroglyph panels. Some of the petroglyph elements contain remnants of red pigment. Modern material remains, although few in number, consist of expended military munition fragments, probably washed into the canyon by surface water runoff. Aside from offering protection from strong mesa top winds, the site has several tinajas worn into deep drainage channels cut by water erosion above the canyon floor as well as a plunge pool at the base of the cliff face where the drainage channels enter the box canyon. (Significant quantities of water were noted in the tinajas and the plunge pool over an extended period of time during the October recording.) A general lithic scatter and concentrations were found on a bench rising slightly above the drainage channel on the canyon floor and situated at the base of the canyon's north wall. A rockshelter formed by a group of large tuff boulders is also situated on this occupational bench. It measures 3.5 m along its back wall, 3.7 m at the entrance, 2.2 m deep from the dripline to the back wall, and 1.7 m high at the dripline tapering down to .30 m at the back. The shelter roof is partially blackened. The rockshelter has been previously recorded as 26NY2251, but because the shelter is within the boundaries of the petroglyph site, it is included here as an integral component of the overall site.

5.2.1 Prehistoric Lithics

Airfield Canyon's extensive surface lithic assemblage contains both lithic debitage, lithic tools, and ground stone implements. The lithic production industry represents a bifacial core reduction trajectory. Observed lithics include decortication, core reduction, biface thinning, pressure or preparation flakes, bifacial cores, bifaces at various stages in the reduction sequence, and some formal tools such as projectile points, drills, and scrapers, complete and/or fragmented. The lithic

Map 7. Airfield Canyon (26NY2252) Site Plan.





Photograph 4. Plunge Pool at Head of the Airfield Canyon (26NY2252).

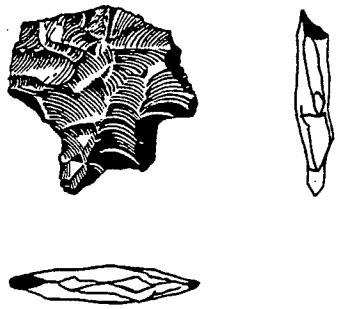
Photograph 5. View of the Airfield Canyon Site Looking West/Southwest.

material is dominated by obsidian, but cherts, jaspers, and silicified volcanics are present in far lesser amounts. Raw obsidian nodules, water worn and heavily weathered, cover the mesa top to the north/northwest and are found in the drainages leading into the box canyon. Their distribution suggests that the primary source is northwest of the site based on drainage patterns. Two projectile point fragments were collected from the site for obsidian hydration and source analysis: a Gatecliff Split-Stem (Figure 9A) found in the vicinity of the shelter, and a Western Stemmed Tradition (Figure 9B) recovered from the mesa top along the north rim of the canyon.

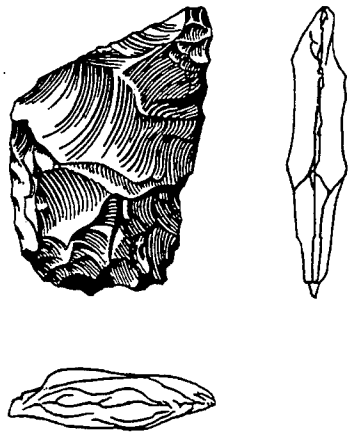
A most interesting stone awl was identified in the surface assemblage. It was fashioned from obsidian elongate shatter that was triangular-shaped in cross-section. The awl measures 5.5 cm in length, has a tapered distal working end, and the proximal end flares out to a width of 8 millimeters (mm), the shaft being 5 mm in diameter. The point and edges of the tool have been rounded from use, possibly in the construction of basketry items.

Two pieces of ground stone were noted. A single-hand, unifacial mano measuring 9 cm in length, 8 cm in width, and 3 cm in thickness, oval in shape, and exhibiting grinding on one face, was discovered on the east side of the shelter at its entrance. The second stone is a single-hand, unifacial mano fragment measuring 11 cm in length, 8 cm in width, and 6 cm in height. In profile, this broken mano has the shape of a right triangle with a slightly convex grinding surface; the palm would have rested on the long upper triangular surface with the fingers cascading down the short face. It is situated between petroglyph Panels R and S.

Bedrock milling slicks, shallow depressions in bedrock ground smooth from abrasion as a result of repeated human action, were observed inside and outside of the canyon. A milling slick measuring 20 cm in length, 18 cm wide, and <1 cm deep is situated on a slightly angled horizontal slab boulder in the middle of the canyon. Situated adjacent to a water drainage channel deeply eroded into the rock of the mesa top and in the vicinity of petroglyph Panel AA, a second milling slick measuring 28 cm in length, 18 cm wide, and 1.5 cm deep was documented.



A. Gatecliff Split-Stem.



B. Great Basin Western Stem.

Figure 9. Obsidian Lithic Tools from Airfield Canyon (Actual Size).

5.2.2 Petroglyph and Pictograph Panels

Panel A: Panel A consists of a snake-like element, two attached rayed circles with multiple rays, and two attached circles with two linear extensions protruding from the upper portion of the top circle. The latter element has been affected by natural spalling, and the actual configuration will never be known. All of the elements appear to be of the same relative age based on equal repatination. This panel is situated at the far western end of the site.

Panel B: Elements of Panel B have been pecked on the sloping surface of a large talus boulder adjacent to the previous panel. The central element is an elaborate curvilinear meandering line with several branches connecting with a tailed circle. To its right is a long, tailed circle with wavy and straight segments. To the left of the central element are four additional elements: two circles, a partial spiral, and a tailed circle with a split tail at its end.

Panel C: This panel, also situated at the west end, consists of three separate meandering line elements with branches and a two-tailed circle.

Panel D: Two areas of random stipple pecking in no definable design occur on the top of this medium-sized talus boulder. On the side of the same boulder is a horizontal meandering line incorporating two circles and a U-shaped branch topped by a straight horizontal line. Faint traces of red pigment are thought to be present in some of the vertical alignments of the latter element and in an area of the random stipple pecking.

Panel E: Panel E is composed of seven separate elements and is situated on the northern cliff face. It is decorated with two circles, a tailed circle, a circle with two tails, an arc, a long, meandering line, all pecked petroglyphs, and multiple vertical scratches. The arc begins and ends on a natural lip feature in the rock, and the two-tailed circle conforms with a natural depression, the rock lip forming the leading circle edge.

Panel F: A tailed circle and a separate concentric circle pattern decorates this panel. The internal circle of the concentric pattern is more square than it is round.

Panel G: Situated on the cliff face on the north side of the canyon is Panel G. It consists of three separate elements including a long, arc-like line, a smaller arc, and three attached circles. The long arched line is 59 cm in length, and random pecking occurs in and around the attached circles.

Panel H: Panel H is also situated on the cliff face. This panel contains an arc and three circles, all attached with straight lines. Random pecking occurs to the left of the combination design.

Panel I: Giving one the impression of Mickey Mouse©, this solid-pecked design is comprised of a central concentric circle with two attached circles (ears). A short, straight line extends downward from the central element. A separate, upside-down arc is situated to the right of this design.

Panel J: Situated at the east end of the canyon on the cliff face above the plunge pool, Panel J is decorated with two separate elements. The element on the left is best described as having an enclosed amoebic shape, while the element on the right is a reticulate design. Both elements appear to be of the same relative age based on equal repatination.

Panel K: Panel K is just to the right of the previous panel on the same cliff face and possibly represents two different pecking episodes. The lowest element is an enclosed amoeba and appears older than the uppermost elements, which consist of a separate short, diagonal line and a short, meandering line. Between the upper and lower elements of the design is a meandering line attached to a reticulate element that includes a partially rayed concentric circle; the five rays extend upward. Just to the left of this design are two circular areas containing faint traces of red pigment. The central design appears to be the same relative age as the lower figure due to equal patination color.

Panel L: This panel is extremely difficult to see and contains two separate elements of the same relative age judging from the patination color. The lower element is a complex line element containing both curvilinear and rectilinear characteristics. Two line-connected circles represent the upper element. Water run off and moss/lichen growth have affected this panel.

Panel M: A rayed circle and two attached circles are depicted on this panel. The six rays of the circle are scratch marks rather than pecked as the circle.

Panel N: The most complex and striking of all the panels at this site, Panel N consists of numerous elements in separation and in combination, and probably represents multiple episodes of creation over an extended period of time (Figure 10). The multiple episode assumption is based on different degrees of element repatination. The panel is roughly 3 meters wide. Beginning at the left side, a multi-tailed circle is above a circle containing three vertical-pecked lines. To the right of the multi-tailed circle are three lightly abraded lines, and below them is a grid element containing five

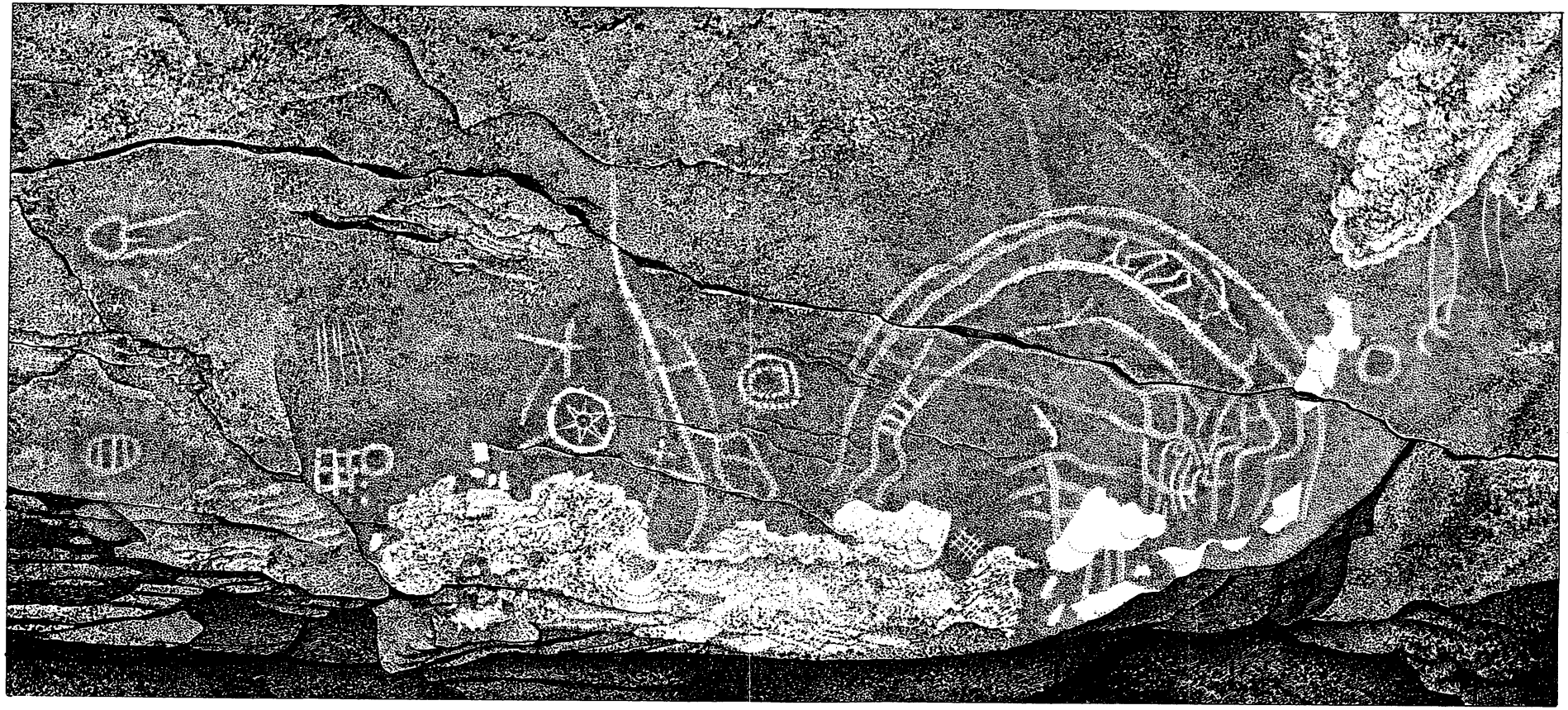


Figure 10. Panel N, Airfield Canyon (26NY2252).

squares with an attached circle. In the central area, a long vertical line, a cross, a concentric circle, and an internal rayed circle are present. The internal rayed circle is pecked on the outside with the rays being scratched in. A series of four nested arcs is the essential element of the complex design on the panel's right side. Rainbow-like, the arcs are joined and terminate in a rake element on the left side. The arcs have additional connecting lines in the lower right portion. One set of connecting lines was added to the design later than the original creation. Additional wave lines are pecked to the left of the rake's tines, as is a group of diagonal scratches. To the left of the rainbow-like design are pecked and scratched vertical lines.

Panel O: Panel O consists of two meandering lines and a two-tailed circle situated on the south side of the canyon.

Panel P: A long, linear arc and a vertical line with a hook are depicted on this north-facing panel.

Panel Q: A single meandering line, a diagonal line, both pecked, and some vertical scratching occur on this panel, which is situated on a talus boulder on the south side of the canyon.

Panel R: Both pecked and scratched elements occur in combination and separation on Panel R. Diagonal scratches are situated below a horizontal wavy line that incorporates a single, lightly pecked circle in its center. To the right side of the circle, multiple sinuous scratched lines extend downward from the horizontal line. Multi-converging diagonal lines are situated above the central wavy line element.

Panel S: Complex in design, Panel S was pecked and scratched. Two distinct episodes are represented judging from differences in repatination colors as well as some reworking of older elements. Beginning at the panel top, a circle has been attached to a spiral. Below that element is a branched vertical line extending downward to form a vertical, meandering line that branches to the right and incorporates a tailed circle that appears to connect to a rayed circle. The rayed circle, portions of the tailed circle, and the connecting vertical line appear to have been repecked at a later time. Vertical scratch lines are found just to the left and below the rayed circle. A lightly pecked circle is also present, as is random pecking.

Panel T: Panel T is inside a concavity carved by the erosional forces of fast-moving water. Elements carved on this panel are the result of two pecking episodes with some superpositioning

of the later elements. The earliest pecking episode consists of a reticulate pattern joined by line-connected circles. Below this design is a single rayed circle with five equally spaced rays, and to its left, another rayed circle with four rays extending downward. In the upper portion of the panel and partially superimposed is a concentration of random pecking, and above that is a mountain sheep character.

Panel U: Just to the right of the previous panel and pecked into the rock face of the same water-cut channel are a long, horizontal line, two separate reticulate patterns, three line-connected circles, a zigzag line terminating in a tailed circle, and a circle with two internal, short, vertical lines leading downward into a triangular attachment.

Panel V: Situated east of the main drainage channel on the mesa top at the edge and above the plunge pool is a single meandering line with an attached reticulate pattern. The design appears to be relatively fresh in origin: the pecked element has little or no repatination against the dark background of the original desert varnish patination. The element may depict or represent the meandering drainage channel itself.

Panel W: Resembling a partially plucked daisy, a single-tailed circle with three attached circles can be found at the edge of the mesa above the plunge pool.

Panel X: Similar to a complex meandering line or reticulate pattern, Panel X contains a rayed circle. Positioned on the circle are meandering lines that continue on the outside and connect the rays in a circular pattern. Two other circles, two straight vertical lines, and a vulva-like element decorate the top of the outside circle of this design.

Panel Y: This panel consists of separate and connected design elements. The separate elements include two double-tailed circles, three single-tailed circles, and three short rectilinear lines. Meandering lines connect twelve additional circles, some of them being single- or double-tailed.

Panel Z: Simple in design, this panel contains an "M"-like element and a "J"-like line.

Panel AA: Situated on the mesa top above the canyon and adjacent to the main drainage channel, Panel AA consists of a barbell-like element in diagonal alignment, and a two-tailed circle. To the left of the barbell-like character is a vulvaform as well as a short, diagonal line.

Panel AB: Tucked under a small overhang on the south side of the canyon, this simple panel is composed of random vertical and diagonal scratch marks.

Panel AC: The last panel recorded is situated on the south canyon wall. Panel AC contains two parallel, vertical scratch marks.

5.2.3 Incised Stone

During a probe placed in front of the rockshelter (see Section 5.2.4, Probe Units), HRC archaeologists identified a fragment of a flat, portable, rhyolitic rock, with an incised surface (Figure 11). The scratched rock was situated a few centimeters above a suspected hearth deposit that was radiometrically dated at 2190±140 BP (see below for chronometric dates). Measuring 13.1 cm in length, 5.3 cm at its widest, and 2 cm thick, it had been battered or shaped on the ends by the removal of a few flakes from its otherwise rounded and waterworn surface. Although the rock is a fragment of a larger stone, it appears that the rock was naturally broken prior to incising. This assumption is based on slightly rounded, weathered edges along the straight break. Some of the incised lines resemble random strokes across the face, while others produce what are thought to be intentional designs, such as two nested lines forming a chevron pattern. Many of the lines originate or terminate at small vesicles and/or incorporate the vesicles into the lines (much like connecting the dots). These connections form triangles, grids, and/or cross-hatching patterns. Stones with elaborate incised lines forming consistent and recurring design elements have been identified in southern Nevada (Santini 1974) and throughout the Great Basin (Tuohy 1986). Although this stone is not as elaborate in design pattern as those reported by Santini, the function of such artifacts remain open to speculation. Three possible functions include portable art, ceremonial objects, and/or sharpening tools.

5.2.4 Probe Units

Two 50- by 50-cm units were probed at separate locations within the site's boundaries. Their locations were selected based on potential subsurface cultural material, revealing stratigraphic profiles, and the accumulation or removal of soil sediments. Probe Unit 1 was dug to a depth of 50 cm, while Probe Unit 2 was terminated at 40 cm, the 30-40-cm level being sterile of artifact

material.

Probe Unit 1. Situated in front of a rockshelter formed naturally from a grouping of talus boulders, Probe Unit 1 was on a prominent sloping bench beneath the north canyon wall. The unit lies between the ephemeral channel and the canyon wall and is surrounded by rockfall debris. Surface material is silty sand covered by loosely scattered organic litter. The upper 5 cm is composed of silty sand with a loosely spaced layer of lag gravel. The next 40 cm is composed of sand, gravel, and cobbles. The bottom 5 cm is represented by exposed cobble/boulder deposition of unknown extent. One cobble projects over 20 cm from the south unit wall and 20 cm up from the base. Observed cobbles and gravels are subangular to angular in shape. There are fine rootlets and rodent burrows present at all depths. The upper 25 cm is medium brown in color with a high level of root activity; the lower 25 cm has a lighter brown color with less organic activity. A thin 2 cm charcoal layer is visible in the sidewall between depths of 20 and 25 cm at the corner of the west and north walls. (A charcoal sample was removed for radiocarbon dating as called for in the scope of work and discussed in the projects Implementation Plan [White 1998b] for the purpose of establishing chronometric age related to the cultural use of the study sites). Soil materials in the unit are a combination of alluvium from above the canyon wall and rockfall from the wall itself. Well-defined bedding, or stratigraphy, is absent, and cultural material was mixed throughout the unit (see below). Despite this, the charcoal lense probably represents a definable hearth feature. This suggests additional buried cultural material in the area (Table 4).

Probe Unit 2. Probe Unit 2 was situated down slope and to the southwest of Probe Unit 1. Also surrounded by rockfall debris, this unit was situated closer to the ephemeral channel. Surface soil is a silty sand covered by loosely scattered organic litter. Based on sidewall profiles, the upper 5 cm is silty sand and loosely spaced lag gravel. The next 15 cm is composed of silty sand, light brown in color, with gravels and cobbles. The third layer is 20 cm thick and is made up of well-compacted silty sand, light grey in color, with gravel and cobbles. This layer exhibits an increase in the fraction of gravel and cobbles as it continues downward. A large cobble projects 10 cm outward from the southwest corner and 10 cm upward from the base of the probe unit. One removed cobble measured 25 cm along the primary axis. As in Probe Unit 1, roots and rodent burrows were present throughout with greater frequency in the upper portion of the unit. Only slight changes in

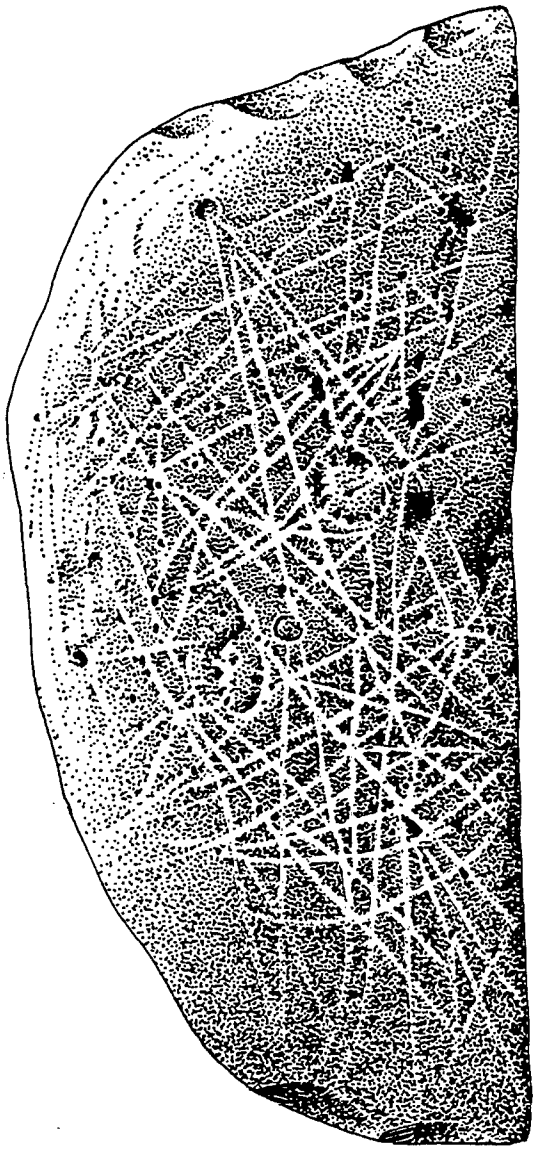


Figure 11. Incised Rock.

soil color and texture occurred; well-defined bedding was not present in this probe unit. Prehistoric material was noted in the upper 30 cm of screened soil (Table 4).

5.2.5 Artifacts Noted During Probes

Prehistoric artifacts were observed in the arbitrary levels of both probe units. A total of 1,394 pieces of lithic debitage were recorded as well as a portable, scratched rock (see below) and three faunal bone fragments. The greatest amount of lithic debitage was made of obsidian, but silicified volcanic and chert materials were also present in a far lesser percentage. Because of the quantity and variety of the artifacts noted, the material is presented below in tabular form.

Table 4. Artifacts Observed From Probe Units 1 and 2, Airfield Canyon (n=1394).

Type	Surface	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm
PROBE UNIT 1						
Biface Stage 1	2					
Biface Stage 3			1	1		
Decortication flake	2	3		4	2	
Core reduction flake	12	47	65	53	29	8
Biface thinning flake	8	62	75	55	41	7
Pressure flake	6	73	99	106	66	15
Broken flake fragments		24	165	18	38	66
Shatter	3	16	20	45	37	
Other type		1[(a)]	3[(b)]			
Totals	33	226	428	282	213	96/1278
PROBE UNIT 2						
Core reduction flake	1	7	5	5	0	
Biface thinning flake	3	3	7	4	0	
Pressure flake		10	8		0	
Broken flake fragments	4	30	12	14	0	
Shatter	1	2			0	
Totals	9	52	32	23	0/116	

Notes: (a) A portable scratched rock.
(b) Three bone fragments.
cm = centimeters
n = number

5.3 WHITE RIVER NARROWS (26LN210)

Confined by the welded tuff cliff walls of the Narrows, cut and deeply eroded by the waters of the ancient White River, petroglyph and pictograph images were placed at various localities along the entire length of the canyon. Three nearby loci were afforded scrutiny under this study. Locus I, commonly referred to as the "Horseshoe" (BLM 47-110), contains 16 petroglyph and pictograph panels that include some of the most spectacular and complex panels in the Narrows (Map 8). Locus II, the "Pictographs" (BLM 47-4988), consists of 17 pictograph panels painted on a nearly black band of volcanic material. It is situated on a south-facing canyon wall at the juncture of a major side drainage to the White River. Referred to as the "Single Rock" (BLM 47-322), Locus III consists of one west-facing panel primarily of petroglyphs with some pictograph activity. All three loci are in close proximity of State Route 318, which presently enters the canyon at the Horseshoe location, continuing north past the Pictographs and finally past the Single Rock locus, south to north.

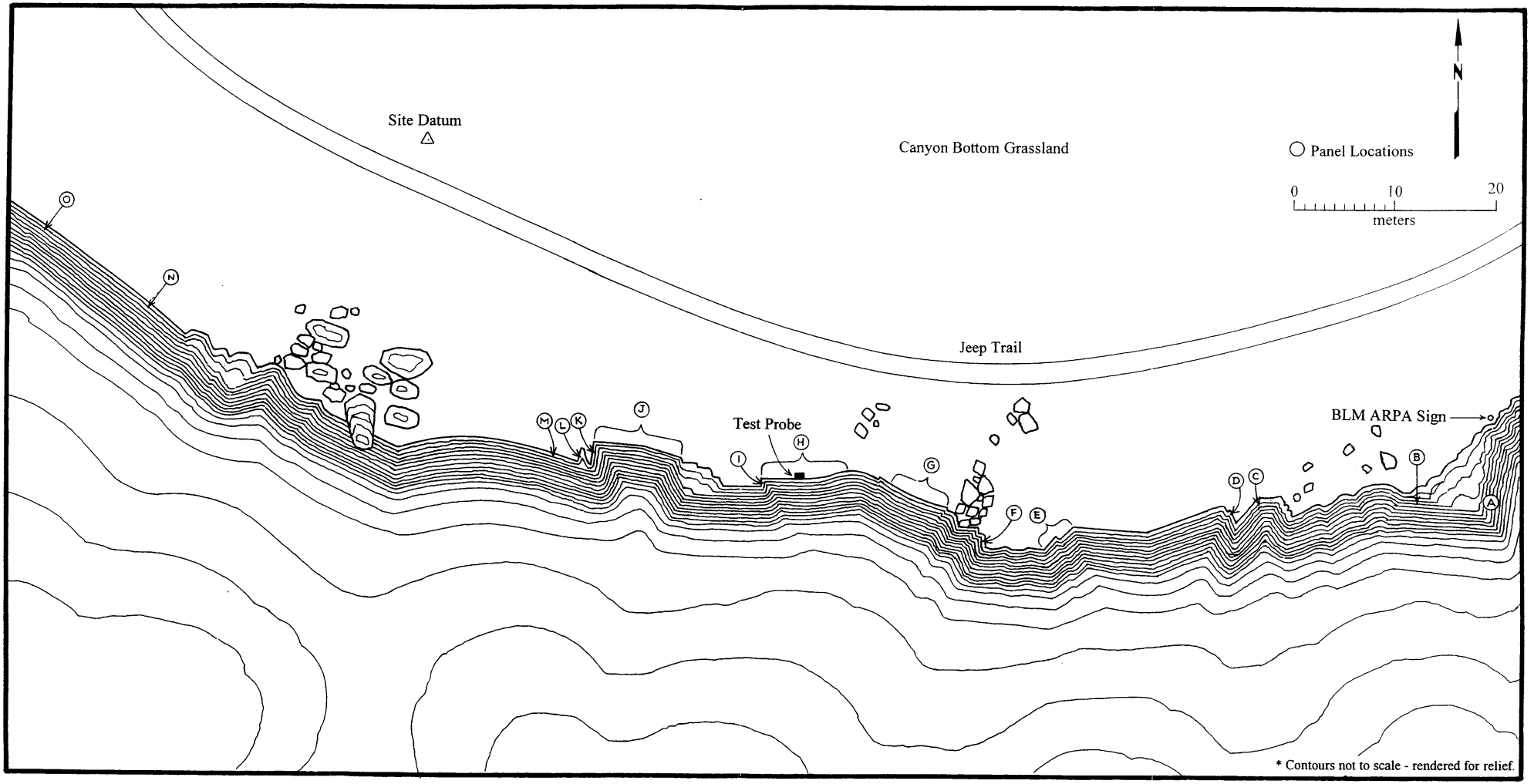
5.3.1 Prehistoric Lithics

Diagnostic artifacts and lithic debitage were not observed on the surface at any of the three loci during the current project. In the recent past, however, lithic debitage and Numic ceramic sherds have been noted at Locus II based on the senior author's previous observations.

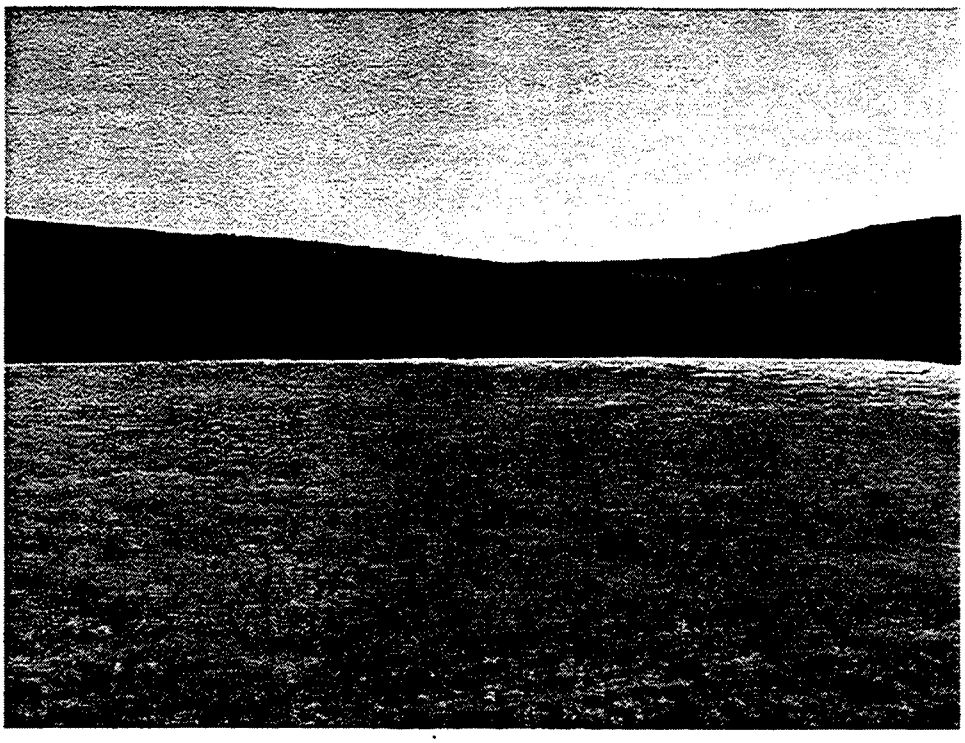
5.3.2 Petroglyph/Pictograph Panels, Locus I (Photograph 6)

Panel A: Situated high above the ground level and accessed by a natural set of stepping rock blocks, this panel consists of two fletched lines, a meandering line in vertical orientation, and a bent line that is partially fletched.

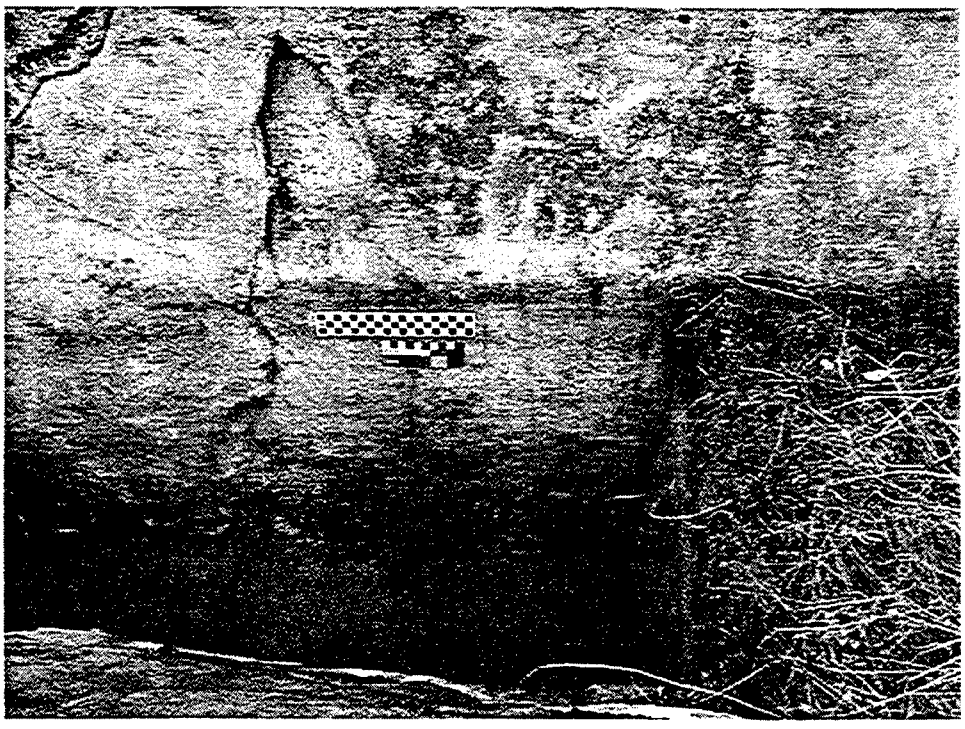
Panel B: Panel B consists of three rakes with various numbers of tines, an ungendered anthropomorph with a concentric circle for a head, a handprint, a foot/paw print, a short horizontal line with two hanging bulbs, three crosses, two partially rayed circles, various curvilinear and rectilinear lines, and random dots. The panel can be observed descending the natural staircase to the



Map 8. White River Narrows (26LN210), Locus I (BLM 47-110), the "Horseshoe."



Photograph 6. White River Narrows (26LN210) Locus I Looking South.



Photograph 7. Locus I Test Probe Revealing Buried Petroglyph Elements.

previous panel almost to ground level.

Panel C: This panel consists of a single chevron and nine slightly diagonal lines grouped and in almost equal lengths.

Panel D: A 1.3-m-long solidly pecked vertical line is found on this panel, as well as a vulvaform element and a pecked hole. Four diagonal lines are grouped and topped with a perpendicular line that has been superpositioned over the elements.

Panel E: Both prehistoric and historic elements are present on Panel E. Prehistoric elements include three concentric circles connected by a line, a sharp tooth-like pattern, a tailed anthropomorph, a dotted dot, a rake with wavy tines, a fletched line, an assortment of vertical and horizontal lines, two meandering lines, and a circle. Vertical scratch marks are present at the top of the pecked elements, and chalking of the petroglyphs by vandals is present. Historic elements include "CW," "HC LERY," "MORT," "GS," and "CARL WILLIAMS / SEPT 18 / 1926." A minimum of three bullet holes are also present on this panel. (These holes are 1 to 2 cm in diameter compared to large caliber impact marks, 5 to 10 cm, observed at the Civet Canyon site).

Panel F: Numerous holes thought to be the result of bullet impacts are found on Panel F, along with historic and prehistoric elements. Historic elements consist of names and dates: "18/9/1926"; "V.H.I / 1960"; and "R. HELSELY." A tailed circle, two connected circles, and one circle bisected by a horizontal line comprise the prehistoric elements. A scratched circle with several possible bullet holes may be of historic/modern origin and indicate possible use as a target.

Panel G: Panel G is the first of three large, extensive panels at Locus I. Design elements of Panel G are complex and contain both historic/modern and prehistoric elements. Situated higher than the prehistoric figures, the historic elements include "RICKY / '76', SPOOK / AUG 17 1977," "CEC," "AE," "NO HORSE," "STEVE / 1977," "LOVE YOU," and an "M" that has been created by the repeated blows of a hammer. Extending for approximately 7+m, prehistoric elements of the panel consist of several arcs, meandering/wavy, and diagonal, horizontal, and vertical lines, a rayed and partially rayed dot, a vertically arranged set of five bird tracks, a gridded rectangular box, a lizard, two partial anthropomorphs, two female anthropomorphs with relief-carved vulvaforms, four separate vulvaforms, two possible handprints, a fletched line, and finally, two bighorn sheep. Scratching is present on the panel, particularly a cross-hatched pattern and most interestingly as an

outline surrounding one of the pecked partial anthropomorphs. Of the two bighorn sheep, both depicted facing left, the lead and larger of the two has four vertically arranged sinuous lines extending upward from the rump area, while the smaller of the two sheep follows close by (perhaps sensing the air).

Panel H: This complex panel, approximately 8.5 m in length, contains historic/modern graffiti and prehistoric elements (Figure 12). Historic/modern disturbances include the phrase "NO HORSES" and the date "78"; "MIKE DAVIS" also placed his name on this panel, but it was later intentionally scratched over in an attempt to obliterate it. A long, horizontal ticked line is the primary focus of this panel, with a significant number of the prehistoric figures occurring below this line, and in one case, vertical lines extending 30 cm below the ground surface, suggesting considerable sedimentary deposition since their creation (Photograph 7; see probe unit for this locus). Generally, the panel contains meandering/wavy arcs; horizontal, diagonal, vertical, and zigzag lines; a grid pattern; tailed circles; five footprints and/or handprints; two concentric circles; a spiral; three attached diamond patterns; a horizontally and two vertically arranged linear dot patterns; several rake elements with both straight and curved tines; two bighorn sheep; a deer; a lizard; two anthropomorphs; and at least two vulvaforms. Rather than in isolated context, the combined elements appear to be telling a story, with many of the elements interacting with, or connected to, each other and to the horizontal line that extends the length of the panel. The horizontal line is relatively straight, except for a small section that turns into a wavy line and returns to the straight linear continuation. Along the line, several branches extend downward, connecting with other curvilinear or rectilinear elements. Tick marks on this line protrude upward, are situated on the eastern half, and some of the ticks are capped with another horizontal line. The eastern end of the line begins with an arc element with ticks radiating from its top; the western end continues and wraps around the corner. One of the vertically arranged linear dot patterns crosses the horizontal line and has both large and small parallel dots; the larger dots are fewer in number and are spaced at irregular intervals, compared to the smaller dots.

Panel I: Situated on a small panel at 90° to and a continuation of the previous panel, elements that decorate this panel include several wavy lines, a fletched line, three nested chevron lines, two nested arc patterns, and two incised vulvaforms. Horizontal scratch marks cross over

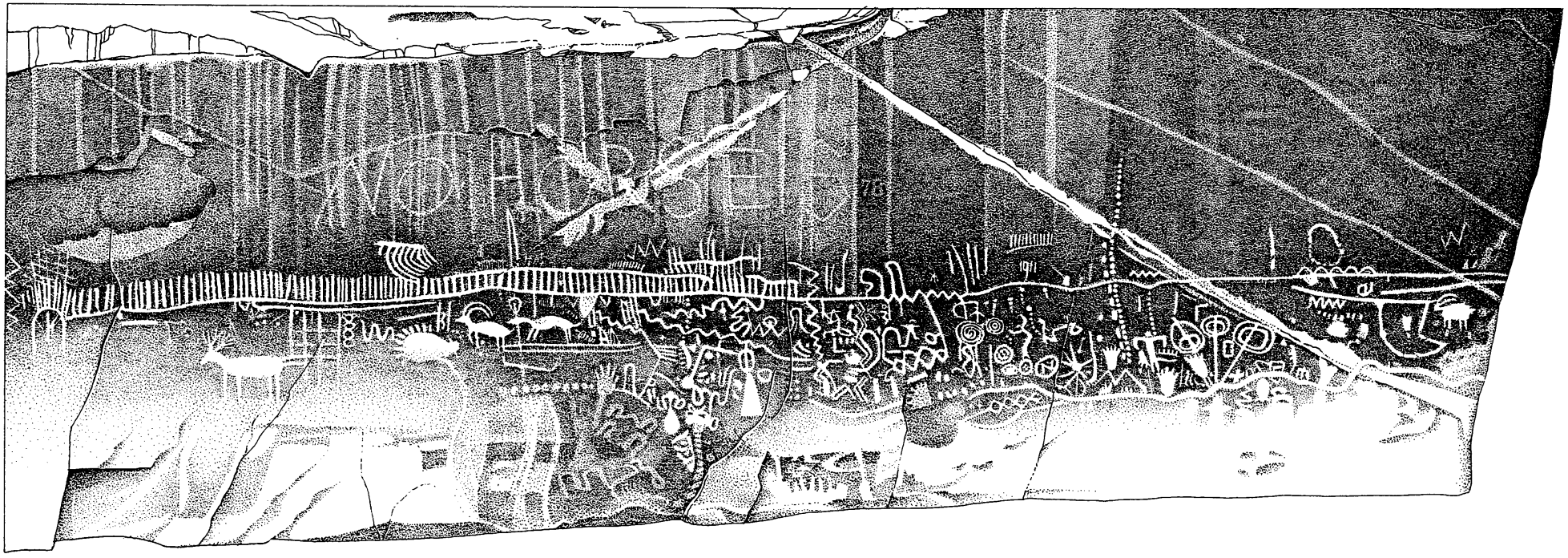


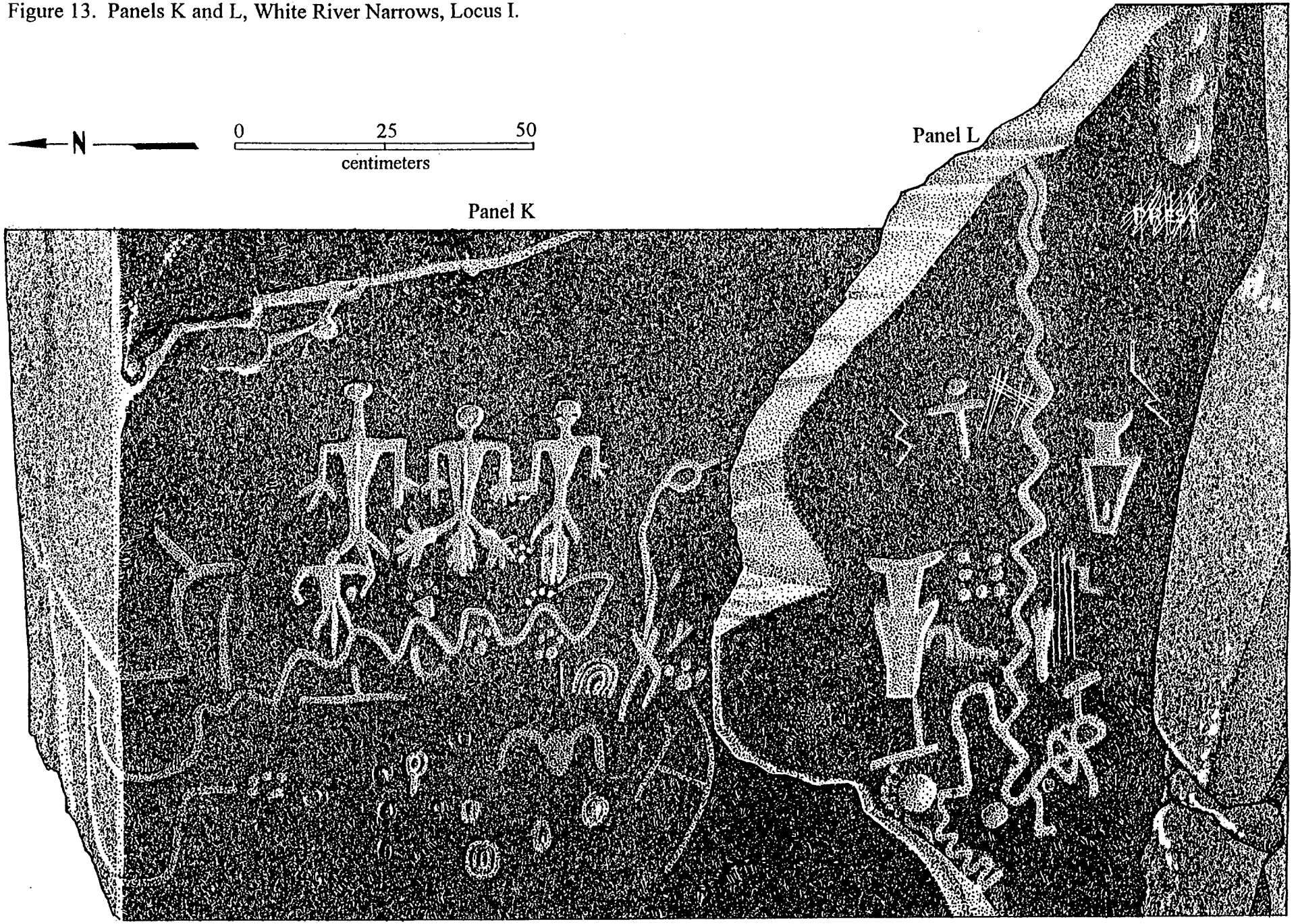
Figure 12. Panel H, White River Narrows, Locus I.

the vertically arranged wavy lines.

Panel J: Aside from the prehistoric elements present on this 9-meter-long panel, "JOEY HIGSEE" left his name here in 1985. A ticked horizontal line with 40 to 50 downward-extending ticks is central to Panel K. Numerous prehistoric elements are found above and below this horizontal line. If the panel is divided in thirds, the eastern section contains three parallel multiple zigzag lines (vertically arranged), an attached diamond element, a large horizontal grid pattern, a row of dots pecked in an S-fashion, two parallel horizontal lines, a rayed dot, two opposing zigzag elements, a single zigzag line, and some vertical scratching above the long horizontal line. Below this line and still in the eastern section are a chevron element, a concentric circle, a handprint, four line-connected circles (vertically arranged), and two bighorn sheep, one smaller than the other (the long horizontal line acts as the back of the larger sheep). Primary elements above the long horizontal line in the central section consist of two zigzag lines, three nested arc patterns to the horizontal line, a dotted dot, two single wavy lines separated by three diagonal lines, and a rayed circle. In addition, there is a patterned body anthropomorph with a coffin-like shaped trunk with eight dots in the central portion. Central section elements below the horizontal dividing line include a handprint, two concentric circles, a zigzag line, three parallel vertically arranged wavy lines extending downward from horizontal line tick marks, two diagonal lines, and four horizontal lines crossing a downward tick mark. At the western section, a single zigzag line is above, while a reticulate pattern, two meandering lines, a handprint, and a rayed dot are pecked into the rock face below or attached to the long, horizontal line.

Panel K: Essentially a continuation of the previous panel by virtue of connection to the long, horizontal line that wraps around the 90° edge of the rock face, Panel K contains three side-by-side anthropomorphs as the central focus (Figure 13, left side). Square-shouldered and trapezoid-shaped (typical of Fremont origin), two of the anthropomorphs have vulva-like appendages hanging between their legs, with the third representing a possible male figure. Faint traces of red pigment are found in the body cavity of the central figure. A lizard-like element is directly below the suspected male anthropomorph. Incorporating or enhancing natural flaws in the lower portion of the panel, five or six vulvaforms have been created, one vulva depicted with two nested arcs over a natural rock inclusion. Other decorative elements include a meandering line, two double-tailed circles, an H-like

Figure 13. Panels K and L, White River Narrows, Locus I.



element, six dotted dots (possibly representing animal tracks), and an "X," or cross element.

Panel L: Immediately adjacent to the previous panel, Panel L consists of both prehistoric and historic/modern elements (Figure 13, right side). At some time, a person carved the letters "PRESS" into the rock face; attempts to obliterate the name/phrase by scratching were made more recently, both being acts of vandalism on this prehistoric panel. Prehistoric scratching includes grouped vertical and diagonal lines. Three partial anthropomorphs are found here; two are horned with trapezoidal heads and bodies (Fremont-like), and one simply has a straight stick body, arms, and a dot for a head. Faint traces of red pigment are found in the two trapezoidal figures. Other pecked elements include a long, vertical-meandering branched line attached to a two-tailed dot, a pattern of seven dots, a small, diagonal zigzag, and a separate dot.

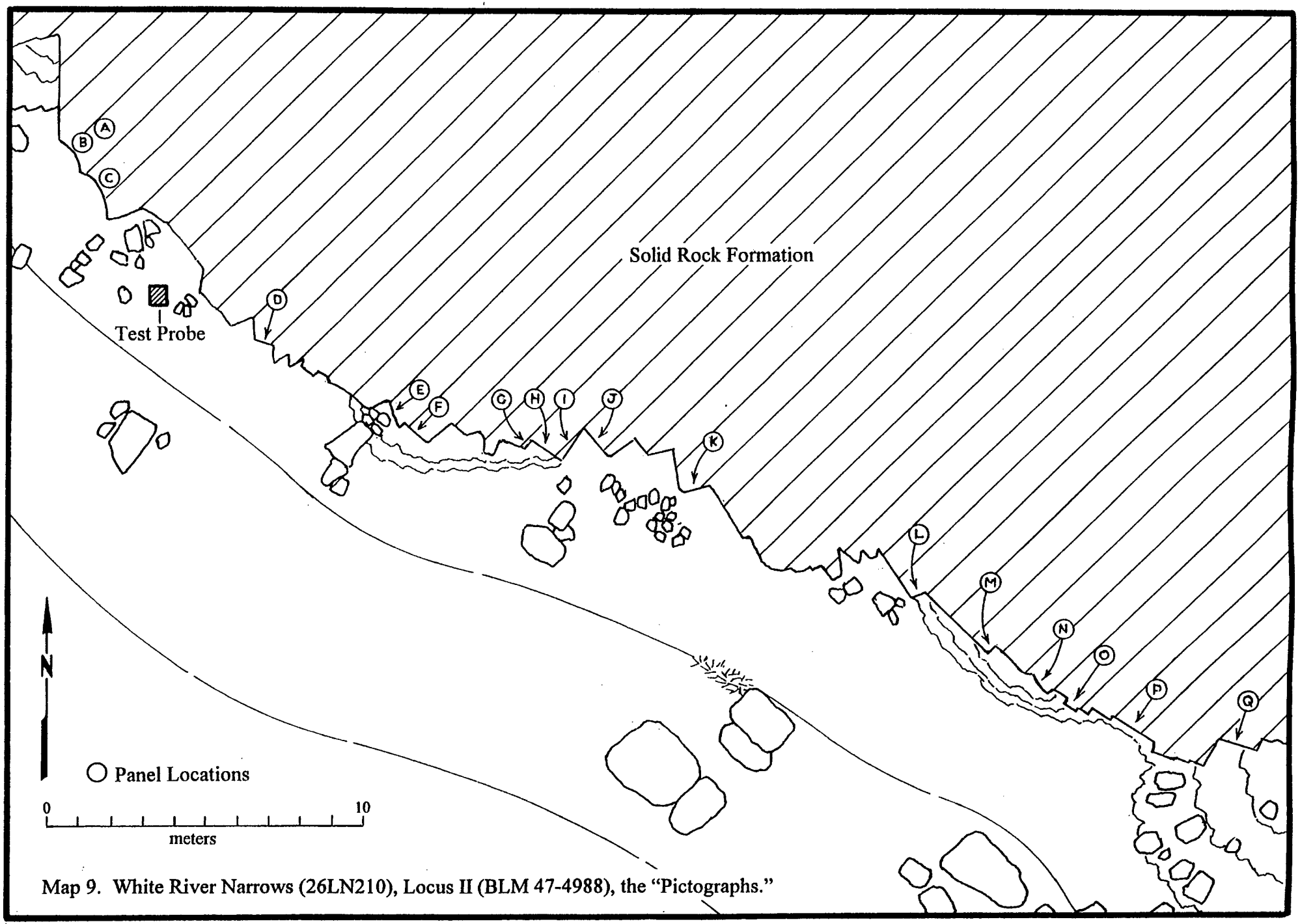
Panel M: An anthropomorph, a short, vertical zigzag, and a lizard-like figure are depicted at Panel M. Animated, the lizard-like figure is tilted on the diagonal, and the left forelimb and the right rear hind limb are depicted clutching natural nodules in the rock material, while the right forelimb reaches for another nodule. The legs on the anthropomorph are arc-shaped, sweeping upward, and give the element the appearance of an anchor.

Panel N: A 46-cm-long, horizontally aligned zigzag element is the only pattern that decorates this cliff face panel.

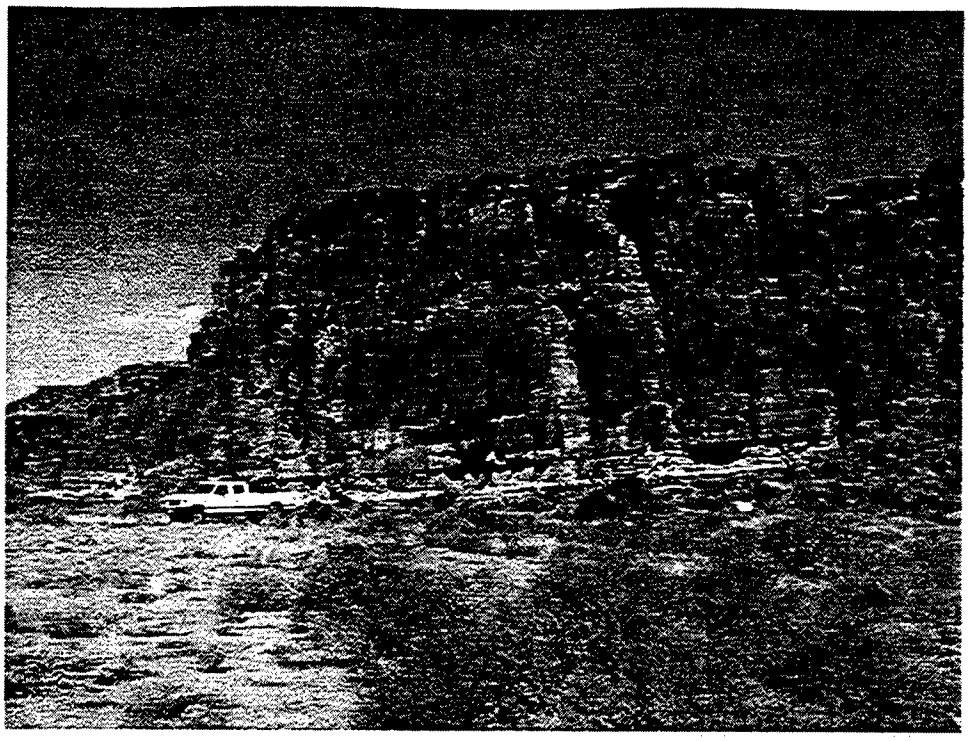
Panel O: Situated at the extreme western end of this locus, Panel O consists of a squared wavy line, a horizontal zigzag, a gridded rectangular box divided into four equal vertically aligned spaces, an arc, a group of six circles connected with two solidly pecked dots, a meandering line connected to a single-tailed circle, and a group of six dots.

5.3.3 Pictograph Panels, Locus II

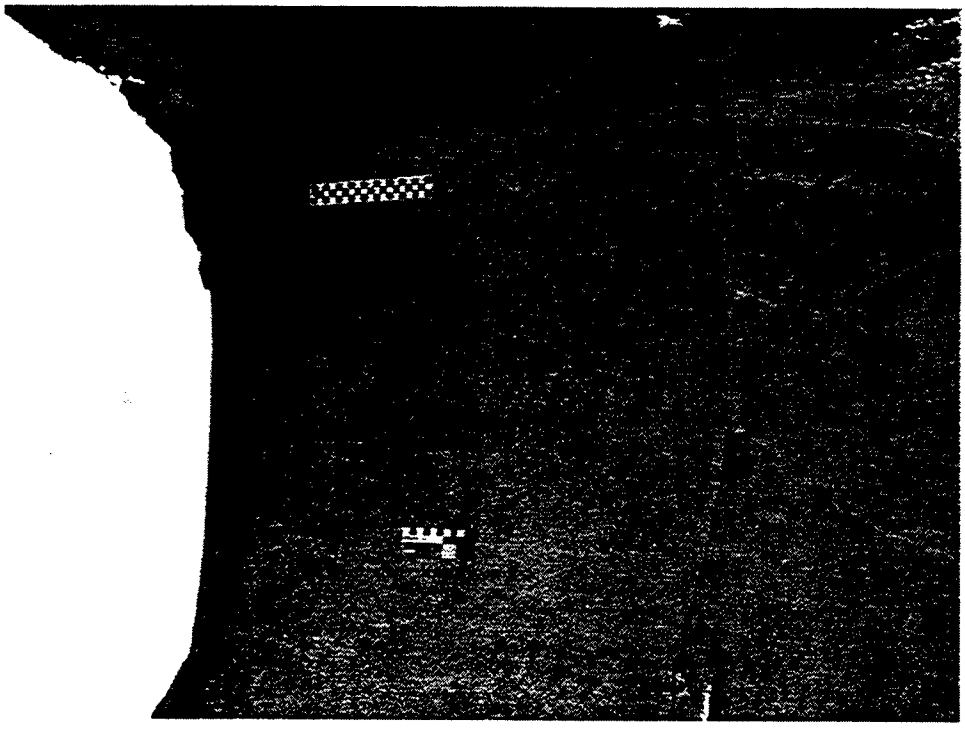
Unique to all of the archaeological sites within the White River Narrows Archaeological District, the panels at this locus consist exclusively of red pigment-painted pictographs along with random scratching and modern vandalism (Map 9; Photograph 8).



Map 9. White River Narrows (26LN210), Locus II (BLM 47-4988), the "Pictographs."



Photograph 8. White River Narrows Locus II Looking Northwest.



Photograph 9. Panel J, Three Finger Drag Pictograph Elements.

Panel A: Situated at the west end of the cliff face and high above the ground level, this pictograph panel consists of a double rake and a double-chevroned vertical line. The latter element may represent a plant, a lizard, or a tailed anthropomorph but is considered here as a rectilinear element because of the uncertainty.

Panel B: At ground level, Panel B consists of two painted zigzags connected by a small zigzag line, 2 N-like elements (one is scratched into the rock), two diagonal lines, random vertical scratch lines, and three right triangles (two of the triangles are opposing and are topped or connected by a horizontal line) (Figure 14).

Panel C: Historic/modern graffiti as well as prehistoric elements are found on Panel C. Scratching, and possibly a tan crayon, were methods used to create the initials "WK / MA / ROI." Vertical scratching is also found below the initials and may or may not be prehistoric in origin. To the right of the initials are two opposing, slightly slanted inward triangles. Below the triangle-like figures is a zigzag line 32 cm in length. During recording, it was noticed that a shadow cast progressively downward from the overhanging rock above the panel was similarly jagged and may correspond and interact precisely with the zigzag element during the winter solstice.

Panel D: Panel D consists of the historic/modern initials "MA," which are scratched into the rock surface.

Panel E: The lower portion of Panel E is scarred by a bullet mark, and three large flakes have been removed as a result of hammer percussion on the panel's edge. Pictograph elements depicted on this panel include a branched, curvilinear line, a separate curvilinear line, a vertical line, and a circle.

Panel F: Created by dipping the first fingers of the hand in red pigmented paint and dragging the fingers across the rock face, Panel F consists of no fewer than 14 sets of 3 finger drag marks.

Panel G: Depicted on a narrow, vertical ledge of rock is a single set of three finger drag marks, diagonally oriented.

Panel H: Adjacent and perpendicular to the previous panel, but on a larger scale, this panel consists of no fewer than 13 sets of 3 finger drag marks. A curvilinear painted line cuts through the uppermost finger marks, and another curvilinear line sweeps down the panel face

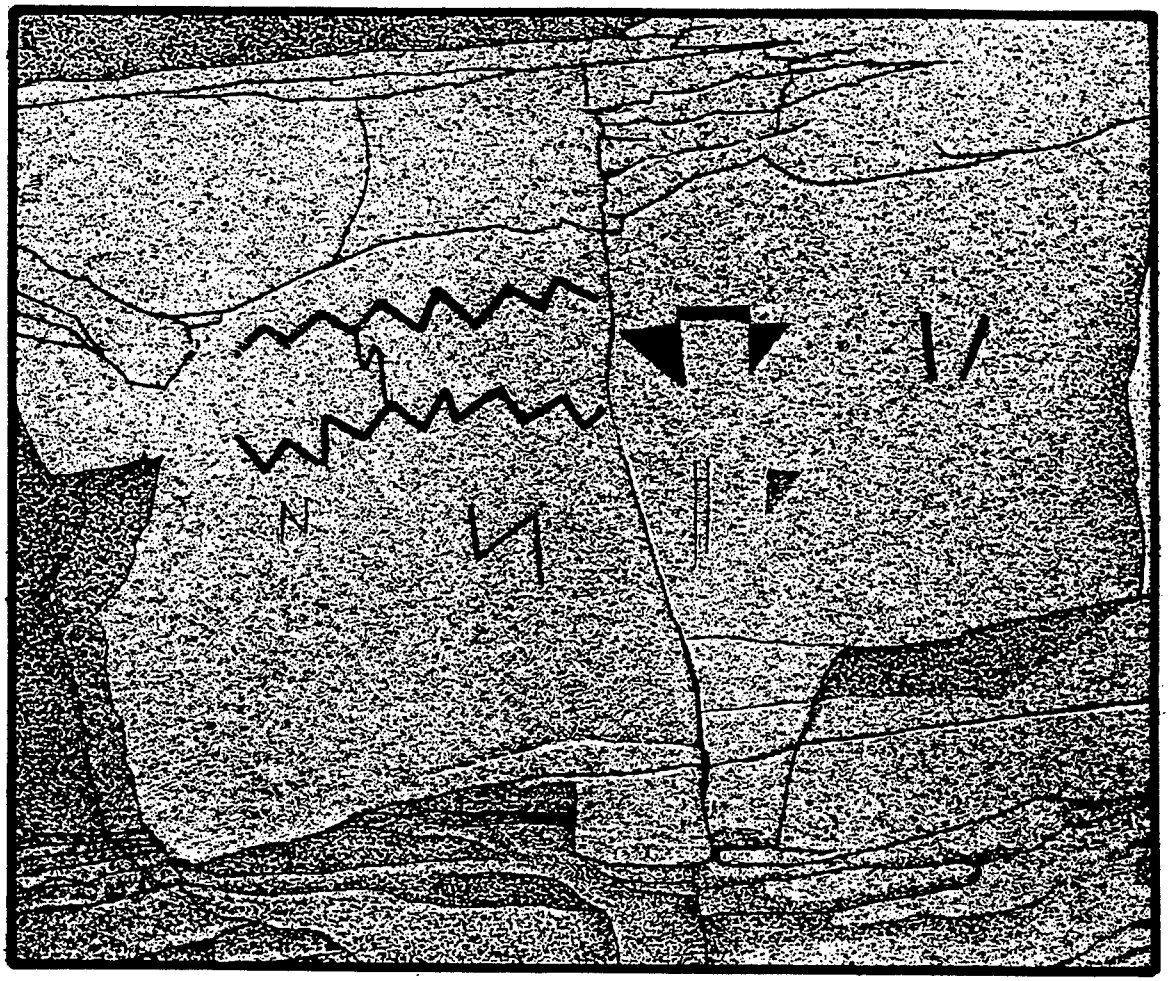


Figure 14. Panel B, White River Narrows, Locus II.

from the finger marks to the bottom portion of the panel, much of it barely visible.

Panel I: Three sets of three finger drag marks are represented on this panel. They are diagonally and horizontally oriented.

Panel J: Barely visible, a large painted grid system is depicted on this panel, particularly on the right panel side, and, to a lesser degree, on the left side. No fewer than 31 sets of 3 finger drag marks are also found on Panel J (Figure 15; Photograph 9).

Panel K: Twelve sets of three finger drag marks are the only elements depicted on this panel.

Panel L: Multiple vertical scratched lines are present on Panel L, as well as five sets of three finger drag marks.

Panel M: This panel consists of six diagonal red pigment lines.

Panel N: Painted elements on this panel include a grouped set of multiple vertical lines, a curvilinear rake, two curvilinear lines, and a single, short, horizontal line.

Panel O: A small painted circle and five diagonal lines are grouped on this panel face.

Panel P: Divided by a natural crack, the right side of this panel includes a circle and four sets of three finger drag marks. The left panel face comprises a circle, several separate diagonal lines, a short, horizontal line, and an arrow or pointer-like element.

Panel Q: Being very faint, this extreme eastern panel consists of 15 diagonal lines and 2 short curvilinear lines, all accomplished in red pigment.

5.3.4 Petroglyph and Pictograph Panel, Locus III

Situated adjacent to State Route 318 and subject to occasional vandalism, Locus III consists of only one panel (Map 10; Photograph 10).

Panel A: Containing mostly historic names, initials, and dates, this single panel also includes prehistoric petroglyphs and pictographs (Figure 16; Photograph 11). Prehistoric petroglyphs/ pictographs include a squared, wavy line a few centimeters above soil level and a concentric circle bisected by a meandering line extending upward toward a mountain sheep (the sheep has a wavy tail extending upward). Above the sheep and to its right is a weighted atlatl complete with hook. Lower

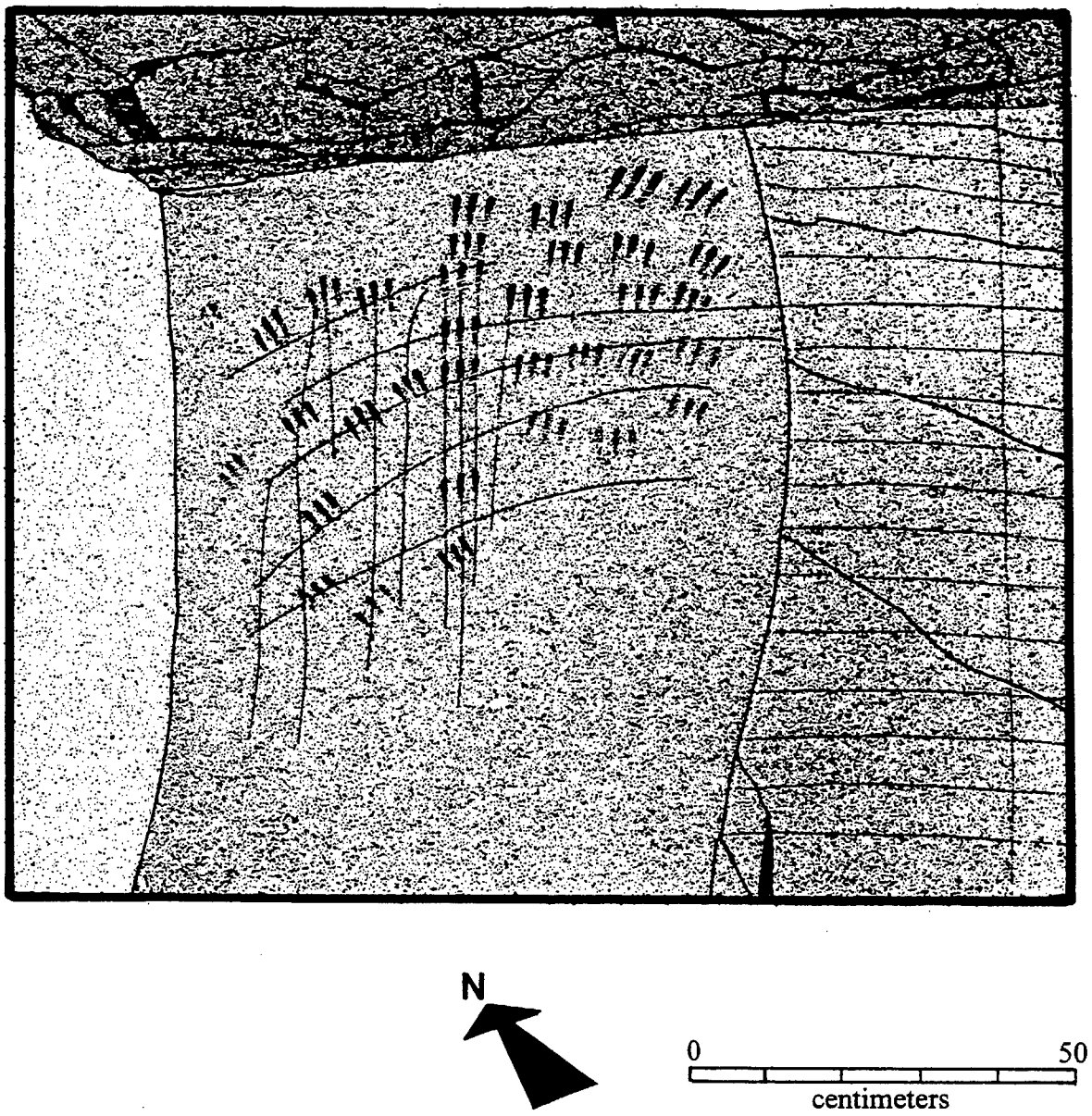
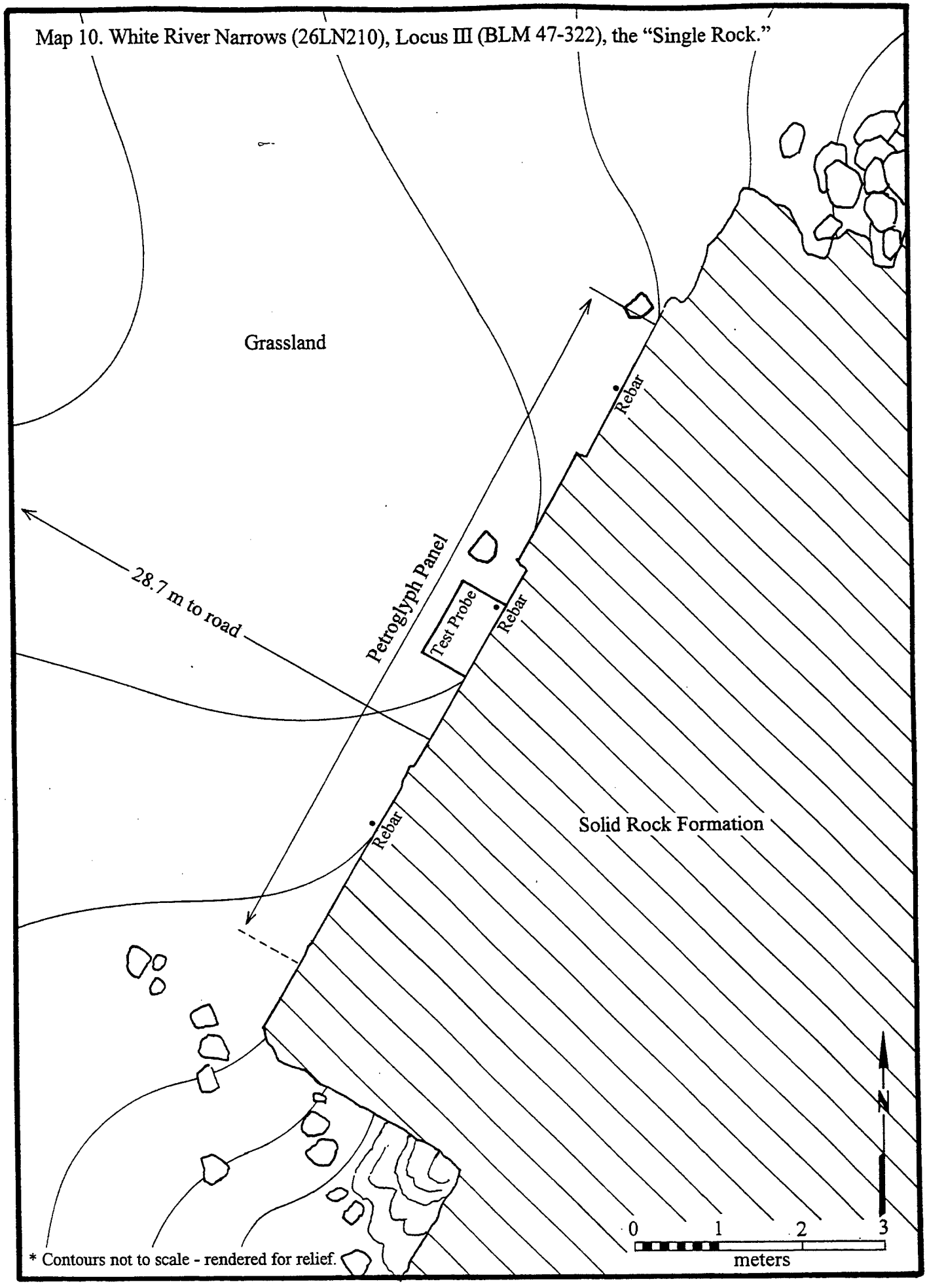
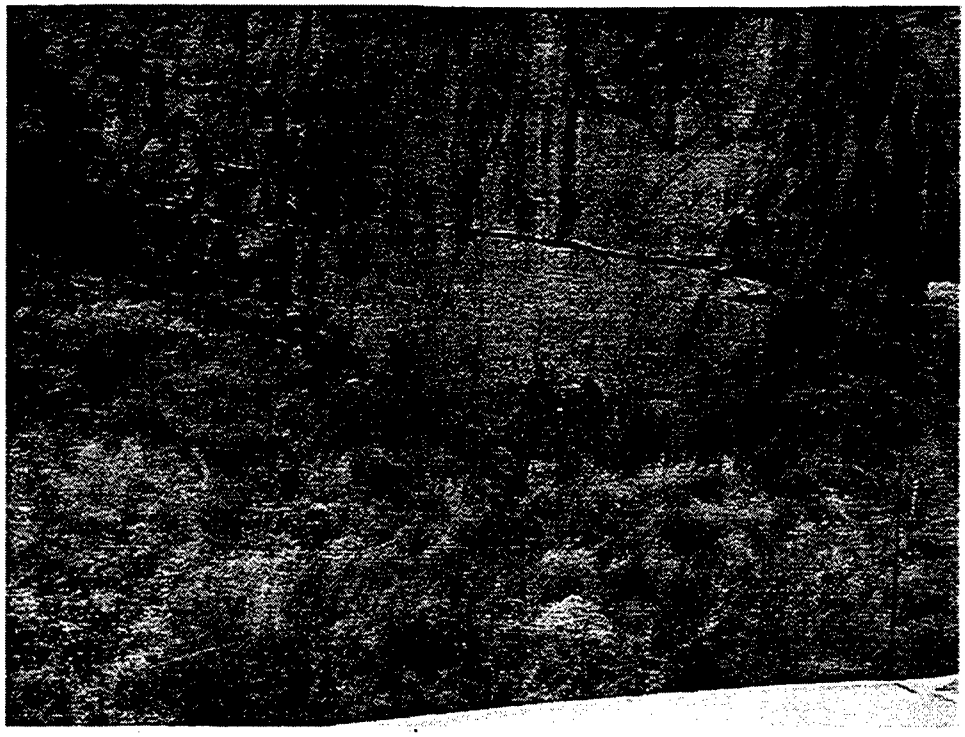
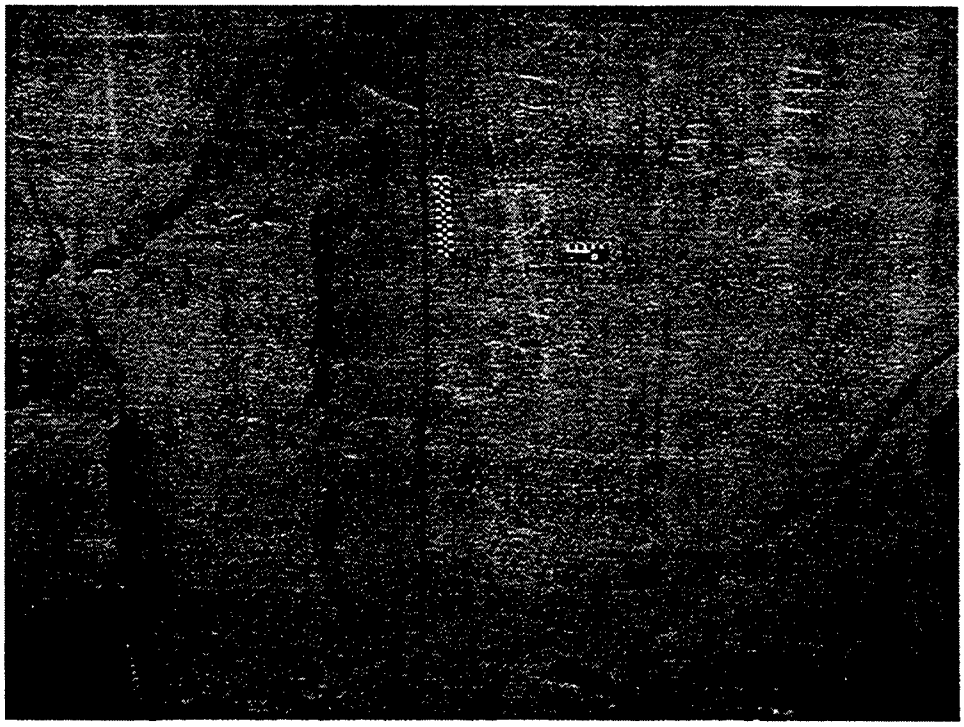


Figure 15. Panel J, White River Narrows, Locus II.


Map 10. White River Narrows (26LN210), Locus III (BLM 47-322), the "Single Rock."
Grassland
28.7 m to road
Petroglyph Panel
Test Probe
Rebar
Rebar
Rebar
Solid Rock Formation
N
0
1
2
3
meters
* Contours not to scale - rendered for relief.



Photograph 10. White River Narrows Locus III Looking East From Highway.



Photograph 11. A Portion of Panel A Focused on Prehistoric Petroglyphs.

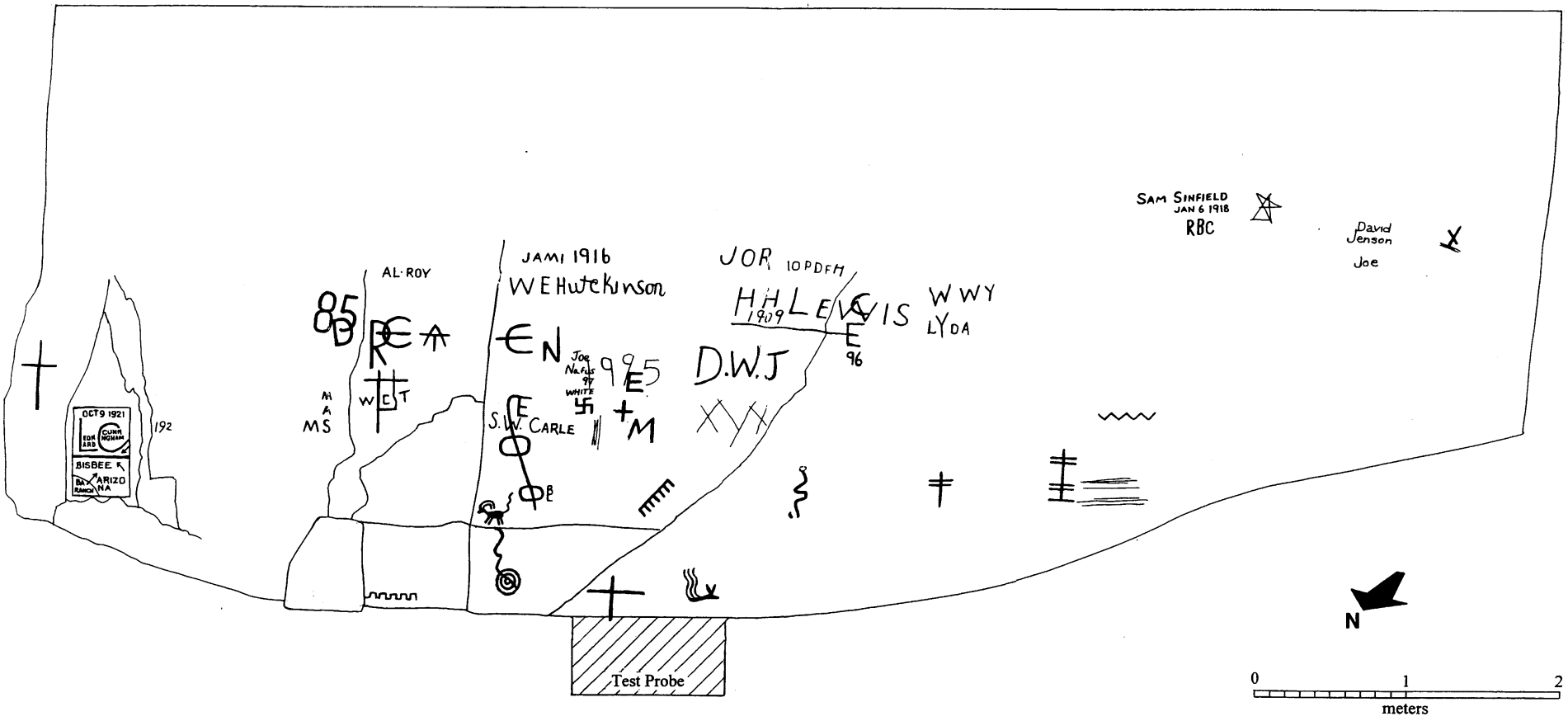


Figure 16. Panel A, White River Narrows, Locus III.

on the panel is a cross, an inclined rake with seven tines, and a legless zoomorph with three meandering lines extending from its rump. Progressing to the right is a snake, a vertical line with two cross arms, a vertical line with multiple cross arms variously spaced, and a zigzag line. Limited scratch marks are both vertical and horizontal in occurrence. Red pigment is found associated with the zigzag and the atlatl elements, acting as additional highlights or decorations.

The historic petroglyphs include "OCT 9 1921 / LEONARD CUNNINGHAM / BISBEE / ARIZONA" enclosed in an incised box; initials "MAS, WCT, DRE, E+M, DWJ, KOR, PDFM, CE, WWY, BL, and RBC"; names "AL • ROY, JAMI, W E HUTCKINSON, JOE NAFUS, H H LEWIS, SAM SINFIELD, JOE, S W CARLE, and DAVID JENSON"; and dates, "85, 1916, 1909, JAN 6 1918, 1995, 192-, 96," with "97" being the most recent. An incised swastika is associated with the word "WHITE" done by "JOE NAFUS" in 97. The 1916 date is in association with "HUTCKINSON, 1909" with "LEWIS," and 1918 with "SINFIELD." A five-pointed star and several cross-like incised marks are also associated with the historic petroglyphs.

5.3.5 Probe Units

Three probe units, one at each locus, were completed within the White River Narrows. Two of the units were 1 m by 50 cm in size, while the other remained at 50 by 50 cm. Because petroglyphs are at or near the present ground surface at study Loci I and III, it was decided in consultation with the BLM archaeologist, Mark Henderson, that probe units should be placed against the cliff wall and be of a larger size at these loci. This was accomplished for the purpose of determining subsurface petroglyph elements and former occupational surfaces. All unit locations were selected for their potential to detect subsurface cultural material and potential stratigraphic soil profiles.

Probe Unit 1, Locus I. This probe unit, 1m by 50 cm in size, was placed immediately adjacent to and at the base of petroglyph Panel H, whereupon pecked elements extended downward below ground surface. Vibrant grass growth covers the ground surface, and the rock face is stained green (a 3-4-cm band) by algae at the soil level. Based on sidewall profiles, the upper 5 cm of soil is composed of grass root fabric and a dark brown silty soil with high moisture content. The next

45 cm is silty soil with sparse gravel that is subangular to subrounded in shape. An angular rock, exfoliated from the cliff face above, was also encountered. The upper 10 cm of the soil is moister, hence darker in color than the lower material, but the texture and the brown color are consistent throughout the soil profile with no apparent stratigraphy. By probing, it was determined that the petroglyph elements extend to a depth of 30 cm into the probe unit. Rootlets, decayed large roots (to 1 cm in diameter), and rodent burrows are present throughout.

At the 50-cm level, a 4-inch-diameter soil auger was used to continue the probe. Three separate auger holes were bored, the deepest going an additional 50 cm, for a total soil profile of 1 m. In all three instances, encounters with large rocks prevented further investigation by this method. Removed soil was homogenous in color and texture with the preceding levels.

Probe Unit 1, Locus II. Placed at the western end of the cliff face on the relatively flat surface of the bench, this unit was 50 by 50 cm and was dug to a depth of 14 cm. Soil at this location is composed of silty sand, with angular gravel and cobbles to 6 cm in diameter. The relative abundance of larger clasts increases with depth. Fine rootlets were present throughout the probe unit, which bottomed out on a pink layer of welded tuff bedrock. Despite the presence of a 1-cm-thick charcoal layer encountered in the western half of the unit at a depth of 7 cm below the surface, well-defined stratigraphy was absent in the sidewall profiles. A carbon sample was removed for radiocarbon dating to determine the chronometric age of the occurrence.

Probe Unit 1, Locus III. As with the Locus I probe unit, the probe at this locus was 1m by 50 cm in size and was placed immediately adjacent to and at the base of the petroglyph panel. The soil color and texture were consistent throughout the unit with no apparent natural or cultural stratigraphy visible in the sidewall profiles. The light brown soil is composed of sandy silt with small, angular gravel and sparsely scattered angular cobbles, probably the result of rockfall from the cliff above the panel face. A rodent nest was encountered, and it was determined that rodent burrows are greatest against the rock face and then extend outward for a distance of 20 cm. A 3-cm-thick charcoal layer was encountered in the west unit half at a depth of 27 cm and is thought to represent a burnt bush rather than a human-caused fire hearth due to the presence of unburnt root fragments. A charcoal sample was collected for standard radiocarbon dating to determine the age of the occurrence. Soil moisture increased with depth at this location. The unit was dug to a depth of

50 cm, where a significant increase in gravel and rock material was encountered. Stratigraphy was not readily apparent in the profiles.

5.3.6 Artifacts Noted in Probe Units

Artifacts were noted in all three probe units. At Locus I, a small chert biface thinning flake was identified at the 10- to 20-cm level, and a small fragment of clear bottle glass was recognized at the 20- to 30-cm level, deposited there probably as a result of active rodent disturbance as noted during probing. Chert comprised the greatest percentage of the lithic material noted in the probe unit at Locus II, obsidian accounting for only one item. By level, the probe artifact assemblage (n=29) of Locus II included: on the surface, two biface thinning flakes, a core reduction flake and a broken flake fragment; at 0-10 cm, three core reduction flakes, six biface thinning flakes, three pressure flakes, three shatter, four broken flake fragments, and two eggshell pieces; and at 10-14 cm, three biface thinning flakes and one shatter.

Although the Locus III unit was probed to a depth of 50 cm, artifacts were noted only in the upper 40 cm. Identified artifact assemblage (n=26) of the Locus III probe unit included by level: at 0-10 cm, a piece of shatter; at 10-20 cm, one pressure flake, two shatter, two broken flake fragments, and nine small bone fragments; at 20-30 cm, one biface thinning flake, two pressure flakes, three shatter, two broken flake fragments, and one piece of animal tooth enamel; and at 30-40 cm, one core reduction flake and a pressure flake. All of the lithic material from the Locus III probe was of a chert-like material, except one small pressure flake of obsidian. Even though the sample is small, particularly at Loci I and III, lithic materials indicate that tool curation and maintenance were ongoing activities at these locations rather than tool production.

5.4 RED PIGMENT CANYON (26LN4232)

Site 26LN4232 is part of a larger archaeological complex consisting of numerous habitation sites, many of them with their own petroglyphs. The site is situated in a narrow, slightly southwest-to-northeast-trending canyon cut into the natural fracture plains of the welded tuff formation (Map

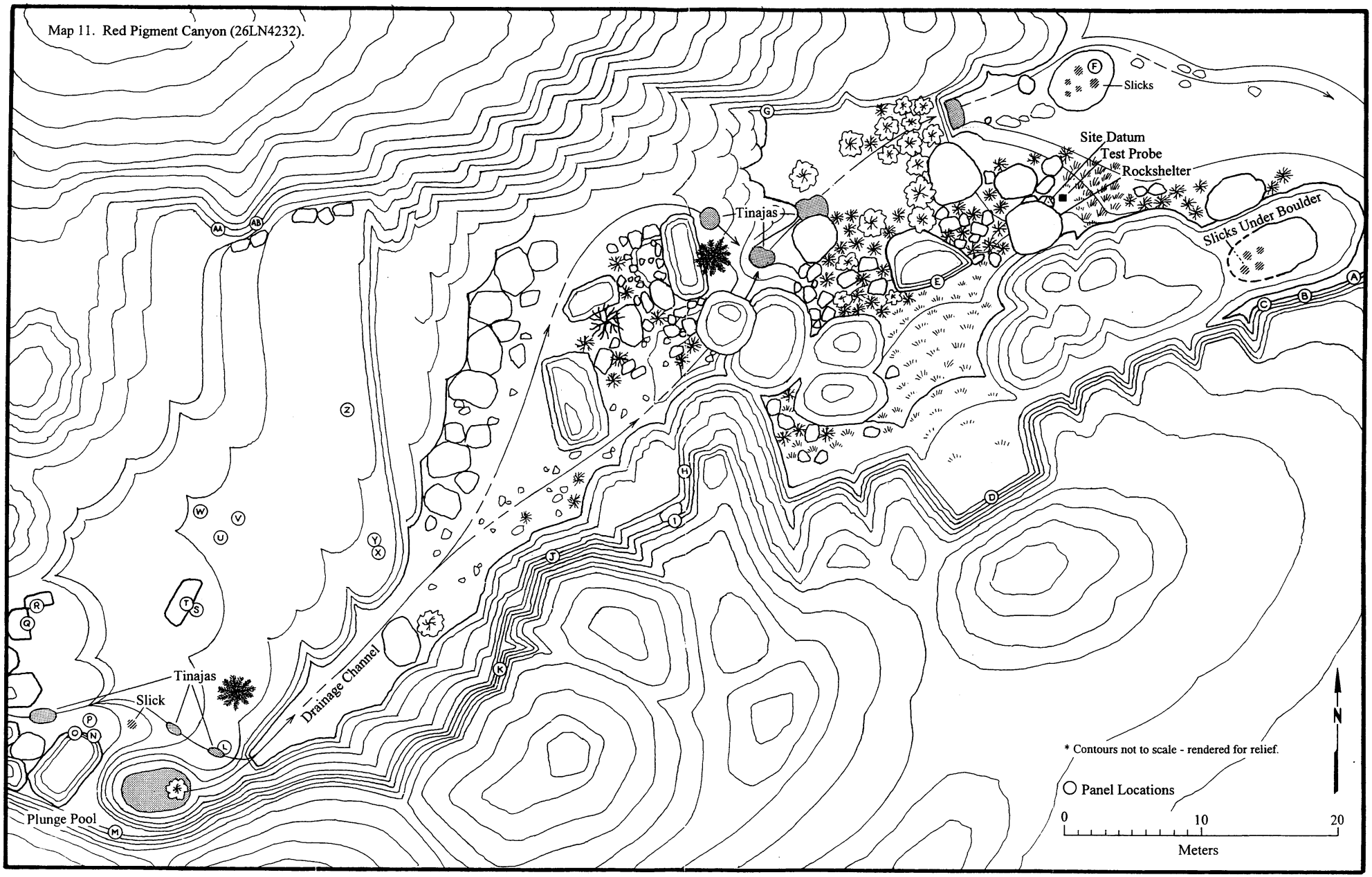
11; Photograph 12). Large, vehicle-size boulders have sloughed off the cliff walls blocking the middle section of the canyon, thus defining the upper limits of the site. It is at this upper location that numerous large tinajas and a plunge pool can be found. These features and smaller tinajas have been eroded into the bedrock and were probably the water source for the larger archaeological complex (Photograph 13). The cliff walls tower above the main drainage from 5 to 10 m. Beginning at the mouth of the canyon and extending up the drainage for approximately 90 m, the site consists of a rockshelter at the canyon's entrance, three bedrock milling slick loci containing a total of 10 slicks, and 28 petroglyph and pictograph panels. Burnt and unburnt faunal bone can be found in numerous pack rat middens within and at the entrance to the canyon. Prehistoric lithics were not observed on ground surfaces at this site, even though lithic material abounds at nearby sites.

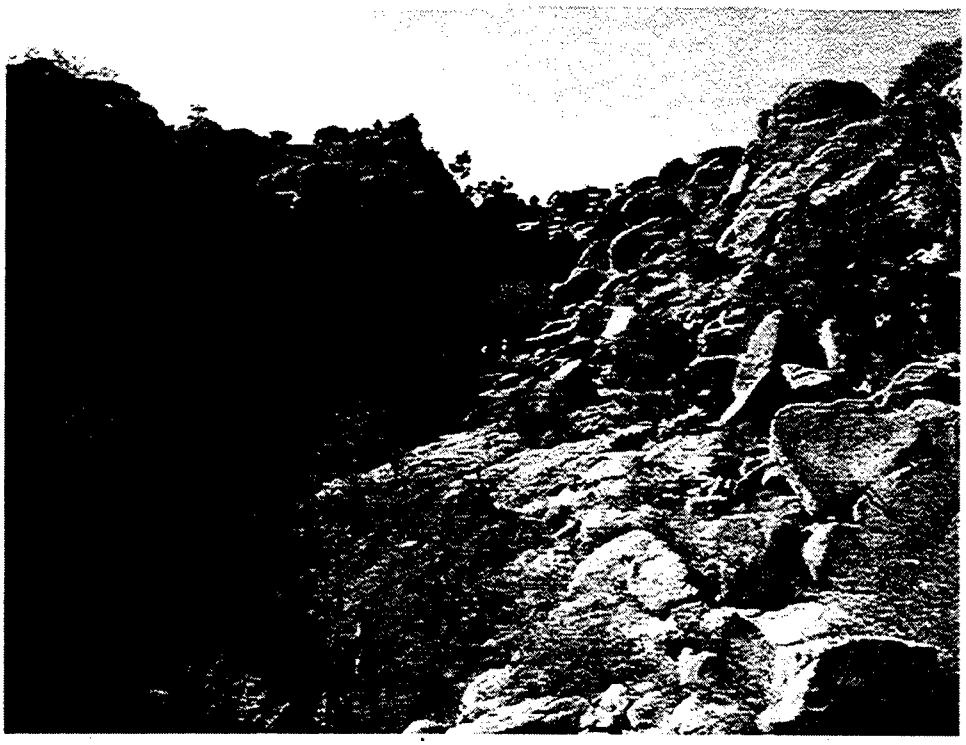
The northeast-facing rockshelter measures 3.6 m across the back, 2.4 m deep from the drip line, and 1.5 m high at the drip line, tapering down to .5 m at the back. The ceiling of the shelter is blackened from either smoke or organic staining. Dark in color, the floor of the shelter is highly disturbed from rodent activity and is dry.

5.4.1 Prehistoric Lithics

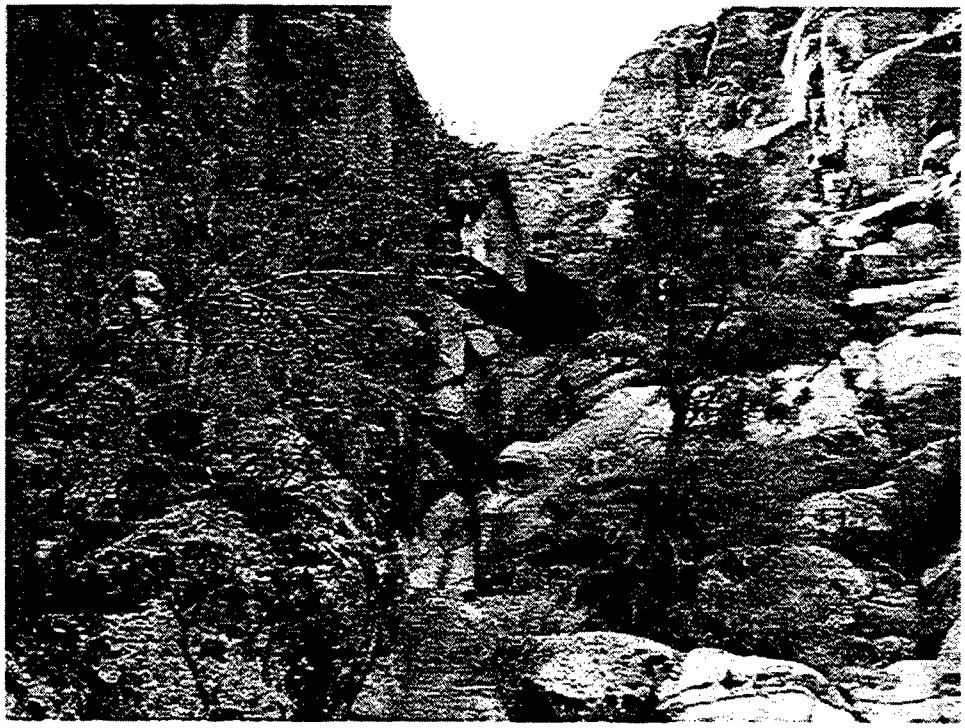
When this site was initially identified and preliminarily recorded in 1997 by the senior author, the apron in front of the rockshelter included a broken mano fragment, a complete white chert Eastgate series projectile point, a white chert biface fragment, and three Numic brownware ceramic sherds (archived site form). The broken tip of a historic cut nail was also identified. These items, unfortunately, were not observed during the present recording and may have been collected as the result of unauthorized activities (see Section 7.4 below). Temporally diagnostic artifacts were not observed, nor was surface lithic debitage identified during the current project for this site.

Bedrock milling slicks are present in the canyon at three locations: under a large, overhanging rock adjacent to the south canyon wall, on a boulder between the rockshelter and the wash channel, and at the upper end of the canyon site. Five milling slicks exist on the flat top surface of the boulder situate between the shelter and the wash channel and measure:


Map 11. Red Pigment Canyon (26LN4232).
Slicks
Site Datum
Test Probe
Rockshelter
Tinajas
Slicks Under Boulder
Tinajas
Slick
Drainage Channel
Plunge Pool
* Contours not to scale - rendered for relief.
Panel Locations
0
10
20
Meters
N



Photograph 12. Red Pigment Canyon (26LN4232) Looking West/Southwest.



Photograph 13. Plunge Pool and Tinajas at Upper End of Site.

- 21 cm long, 16 cm wide, and 1.5 cm deep
- 30 cm long, 17 cm wide, and 3 cm deep
- 23 cm long, 20 cm wide, and <1 cm deep
- 13 cm long, 9 cm wide, and 2 cm deep
- 33 cm long, 27 cm wide, and 3 cm deep.

Petroglyph Panel F is situated on the slanted east face of this boulder. The second concentration of four milling slicks is situated opposite Panels B and C and is protected by a large overhanging rock. The bedrock milling slicks measure:

- 28 cm long, 20 cm wide, and 1 cm deep
- 38 cm long, 20 cm wide, and 1 cm deep
- 48 cm long, 20 cm wide, and 1.5 cm deep
- 25 cm long, 21 cms wide, and 1.5 cm deep.

Situated at the upper west end of the site near the plunge pool is the last milling slick. It measures 34 cm in length, 20 cm wide, and 1.5 cm deep and has been worn into a bedrock exposure.

5.4.2 Prehistoric Ceramics

A single prehistoric ceramic sherd was uncovered in the site's single probe unit. Upon close inspection through a hand lense, the sherd was identified as being representative of a Moapa Gray Ware, corrugated variety, associated with the Virgin River Anasazi of the Moapa Valley, Nevada. It was associated with 10-20-cm level below the ground surface. Numic Gray Ware sherds previously reported for this site were not observed during current site recording, although they abound at adjacent archaeological sites of this large complex as are Fremont-like wares.

5.4.3 Petroglyph/Pictograph Panels

Panel A: Situated at the mouth of the canyon on the southern wall, Panel A contains a concentric circle consisting of four pecked circles and three alternating red pigment circles painted on the raised, natural rock surface. Slightly above the concentric circle element and to its right is a short vertical line, a curvilinear vertical line, and a tilted chevron element.

Panel B: Following the rock fissure face to the west, two mountain sheep are depicted on Panel B. One sheep has four legs with a down-turned tail, while the second sheep is portrayed with two legs and no tail.

Panel C: Badly damaged from lichen growth and rock spalling, Panel C consists of a short, meandering line, a short, horizontal line, random pecking, and no fewer than five zoomorphs, of which three can be positively identified as mountain sheep.

Panel D: Painted with red pigment, this panel is situated high above the canyon floor and is composed of three amorphous shapes, two of which may have been anthropomorphs at the time of their creation. Due to weathering, any distinction has been lost with time, some of the paint washing down and staining the rock face below the main elements.

Panel E: Depicted on the backside of a large talus boulder upstream of the rockshelter is an impressive mountain sheep element 52 by 48 cm in size. The body was first outline-pecked, then the body cavity was filled in with stipple pecking.

Panel F: Northeast of the rockshelter and adjacent to the wash channel on a rounded talus boulder, Panel F contains two arcs, a multiple-tailed circle, and a circle attached to a horizontal line. Several vertical lines extend off the horizontal line. Above the panel are the five previously mentioned bedrock milling slicks.

Panel G: Upstream of the previous panel and on the north canyon wall are three mountain sheep characters and a tailed circle, composing Panel G. One of the sheep and the tailed circle appear more recent than the other two elements, suggesting at least two episodes of pecking.

Panel H: Panel H has a small, ladder-like element and a grid or divided box that are situated high above the canyon floor on the south side of the canyon. The box, slightly trapezoidal in shape, is divided by a single vertical line and six horizontal lines of roughly equal parts. High above the canyon floor in a precarious location, this panel is difficult to access, having to climb to it using various hand and toe holds properly placed on rock surfaces.

Panel I: To the right of the previous panel and barely visible due to lichen growth and surface erosion, Panel I consists of two mountain sheep facing each other, and a vertical line attached to and extending upward from a four-tined rake element. These elements are flanked by two Pahranagat patterned body anthropomorphs, one more difficult to distinguish than the other. The

Pahranagat-style figure on the left has a stipple-pecked lower body, while the upper half is divided by outline pecking, leaving four undisturbed natural areas; the lower quads are arced as if depicting breasts. Natural depressions in the rock occur at the terminus of each arc. A short, handless arm extends downward from the right side. The vague outline of a second Pahranagat-style figure is present on the right panel side, and the only discernable feature is the outline of its left side, along with three lines extending horizontally from that side. No internal design can be ascertained. (Refer to Heizer and Hester 1974; Nissen 1982; and Zancanella and Ferris 1990 for data related to Pahranagat petroglyph elements.)

Panel J: Based on variations in patination and weathering, at least two and possibly three different episodes of pecking are represented on this panel. Certainly the oldest, and barely visible, is the presence of a hooked atlatl standing vertically and measuring 29 cm in height. To its left is a meandering line in the shape of an "M," and below is a gridded circle placed above four separate horizontal lines. A newer anthropomorph is superpositioned over the horizontal lines and appears to be climbing the lines. Above the climbing figure but below the gridded circle is a vulvaform superpositioned over one of the horizontal lines. Two mountain sheep and a reticulate pattern also appear to be the same age as the anthropomorph, while two separate circles appear to be contemporary with the gridded circle.

Panel K: Measuring 57 cm tall and high above the canyon floor in an area that is difficult and dangerous to access, a single, well-defined Pahranagat patterned body anthropomorph is depicted (Figure 17). A weighted atlatl extends horizontally from its right side, and fringe hangs between the two stick legs. The figure's internal design is composed of two vertical lines, one each to the inside of the defining body shape lines. In addition, there are three dotted lines, the left dotted line having eight dots and the other two having seven dots each. A horizontal line connects the three dotted lines at the third dot down from the top. The top or "head" of the figure is expressed by two lines extending upward as a continuation of the outside body lines and legs, the right side terminating in a dot. The left side of the figure is lost as a result of rock spalling.

Panel L: Panel L is situated adjacent to a small tinaja and pecked along a ridgeline of two water-worn rock surfaces. The panel consists of a linear arrangement of a circular and a linear vulvaform above a circle. Three connected circles, the latter circle having a short dissecting line as

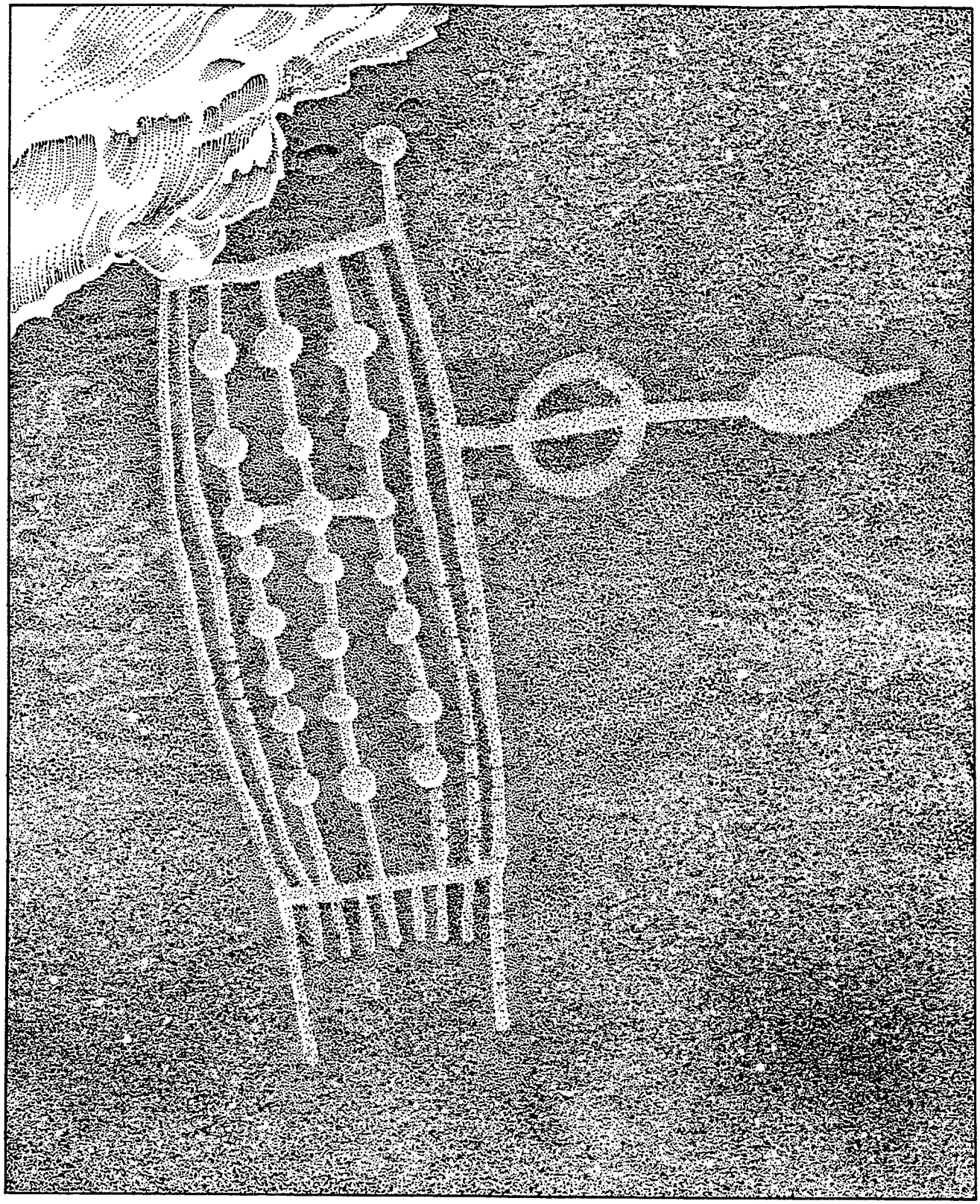


Figure 17. Panel K, Red Pigment Canyon.

if vulva-like in appearance, are on the bottom.

Panel M: Tucked under an overhang and accessed by a narrow ledge under a waterfall is a panel comprised of a single, patterned rectangle. The lower third of the pattern consists of a horizontal line with a vertical line extending downward dividing the space into two equal compartments. The upper two thirds of the design is divided into three equal compartments by two vertical lines extending from the single horizontal line. Three dots, equally spaced, are present to the left of the two vertical lines.

Panel N: This panel consists of a solid-pecked trapezoidal element with branching lines at the top and bottom, four mountain sheep, five grouped vertical lines, a separate vertical line, a cross, and a circle. The sheep and trapezoid appear relatively newer than the other linear and circular elements, suggesting two episodes of pecking.

Panel O: Two mountain sheep, a linear pattern of six dots, and vulvaform decorate this talus slope boulder adjacent to the waterfalls in this canyon.

Panel P: Barely visible due to water erosion of this bedrock outcrop, Panel O consists of two side-by-side gridded ovals divided by numerous vertical lines, three connected circles in linear arrangement, a circle, three circular vulvaforms, and a vertical line. An archer with bow and arrow, apparently shooting at an opposing anthropomorph, and three additional but separate anthropomorphs are also present. The archer and the anthropomorph being shot at both have circles outlining their dot heads. The three separate anthropomorphs are bowlegged, making them similar in appearance of those that might be seen in the Anasazi area of the Virgin River (refer to Schaafsma 1980 for this style's characteristics).

Panel Q: The most westerly of the panels and pecked into a talus boulder, depictions on Panel Q consist of a bisected tailed circle, a circular vulvaform, and a partial anthropomorph. The partial anthropomorph has a tapered body with two stick arms extending diagonally from each side and terminating in fork-like, three-digit hands.

Panel R: This panel's elements include two rakes, one with four tines and the other with six tines, a six-rayed dot, a vertical line, a U-like line, and a pattern of dots vertically arranged in four rows, each row having four dots. Panel R is adjacent to Panel O.

Panel S: A plant-like figure and a hand print decorate this panel, which is on bedrock below a large talus boulder. Visually, the plant-like element consists of a central stalk, five blade-like leaves pairing off the stalk, a horizontal line at its base, and four thinner, parallel lines extending downward from the horizontal line (roots?). The handprint has five digits.

Panel T: An unidentifiable zoomorph (an eight-legged water bug?) and three mountain sheep represent the elements depicted on this panel. Panel T is situated on the large talus boulder above the previous panel.

Panel U: A single, meandering snake with a circular head decorates this panel, which is depicted on a bedrock surface.

Panel V: Using a natural crack in the rock as its beginning or ending point, the major element of this panel consists of a complex linear and curvilinear line configuration incorporating a spall, a rayed circle, a bisected circle and two attached circles. Adjacent to this is a vertical line also beginning or ending at the same natural rock feature. Below the lines are four connected circles, one with a short tail extending downward.

Panel W: The primary element on this bedrock-exposed panel is a circular vulvaform element. Above this and partially affected by a rock spall is a short, vertical line with two V-like extensions on either side.

Panel X: Also on bedrock and partially hidden by vegetation, Panel X consists of two parallel, vertical lines and a rake element with eight tines of various lengths. A bighorn sheep is represented, but the head is incomplete or eroded. The tail of the sheep is upturned and connects with one of the rake's tines.

Panel Y: Panel Y contains a rake element with seven tines and a horizontal line with a short dogleg at one end. The panel is positioned slightly above the previous panel.

Panel Z: This bedrock panel consists of three connected circles with a short, curved tail extending downward and two diagonal lines.

Panel AA: Although hard to discern, the primary element on this cliff face panel is a Pahranagat patterned body anthropomorph. It is portrayed with fringe along the lower body outline and has at least three rows of vertically aligned dots for its interior design. Below the Pahranagat-style figure is a double-tailed circle and a small sheep element.

Panel AB: Also situated on the north canyon wall and the most visible of the panels are four zoomorphs that represent two pecking episodes based on variation in repatination. The largest zoomorph, 1.3 m in length, is both a bighorn sheep and a deer in depiction. Although the sheep's horns are most apparent, two lightly pecked antler horns extend upward from the sheep's upper horn, and the second antler with three terminal branches originates at the back of the neck below the lower sheep horn. The deer's antlers are a later addition to the sheep but appear to be the same relative age. A curved tail and the rear legs may have been repecked at a later date. With long, sweeping, upturned tails, the next three zoomorphs are much smaller than the deer/sheep element and have short "ears" rather than the long, curved sheep horns. These smaller animals are thought to represent canines, or possibly predatory animals such as pumas. One of the long-tailed animals is more recently pecked than the other elements on this panel.

5.4.4 Faunal Material

During the course of site recording, numerous faunal bone fragments were observed in several packrat middens at various locations within the canyon (Table 5). It was noted that some of the bone material had been affected by fire. Nine fragmented items were selected from a rodent nest in the vicinity of pictograph Panel D. Although three bone fragments could not be positively categorized, the most likely scenario is that all of the bone material came from an adult and a juvenile deer, two individuals being represented. The bone material was returned to the original location after analysis.

Table 5. Red Pigment Canyon Faunal Bone Identification.

Family (Genera)	Bone Type	General Age	Remarks
Cervidae (Odocoileus)	Distal femur end	Adult (?)	Fire-affected
Cervidae (Odocoileus)	Distal femur end	Young adult	Burned
Cervidae (Odocoileus)	Distal femur end	Young adult	Burned
Cervidae (Odocoileus)	Astragalas	Adult	Unburned
Cervidae (Odocoileus)	Occipital fragment	Young adult (?)	Burned
Cervidae (Odocoileus)	Phalange	Adult	Burned
Unknown	distal tibia end	Adult	Burned
Unknown	Unknown	Adult	Burned
Unknown	Unknown	Adult	Gnaw marks

5.4.5 Probe Unit

A single 50- by 50-cm probe unit was completed to a depth of 30 cm, bottoming out at an exposure of bedrock. The unit was placed at the base of the southeast canyon wall near the entrance to a shallow rockshelter. Based on the sidewall profile, the surface and the upper 5 cm of soil is composed of coarse sand and gravel. The next 25 cm was deep brown in color and contained silty sand, humus, and scattered cobbles (the largest cobble was 15 cm in diameter). The soil was moist and fragrant (organic smelling), and the color lightened with depth, perhaps as a function of decreasing moisture. An active rodent burrow was found on the east side, and roots in sizes up to 3 cm in diameter were present throughout the probe unit. This soil was not simply composed of weathering products of local bedrock but reflected instead a strong organic influence. Well-defined stratigraphy was not apparent.

5.4.6 Artifacts Noted in Probe Unit

A total of 190 artifacts were noted both on the surface and throughout all 3 unit levels. Lithic debitage comprised cherts and, to a lesser degree, obsidian. Four broken bifaces, non-diagnostic distal ends, were identified in the assemblage, two being made from obsidian and two from chert-like material. Because of a lack of cores and early stage bifaces, significant quantities of decortication flakes, and the presence of broken but finished tools, it is felt that tool curation and maintenance were ongoing activities at this site. The assemblage also included fragmented long bone, a prehistoric ceramic sherd, and single window pane glass shard. Distribution and quantity of noted material is presented in Table 6.

Table 6. Artifacts observed from Probe Unit 1, Red Pigment Canyon (n=190).

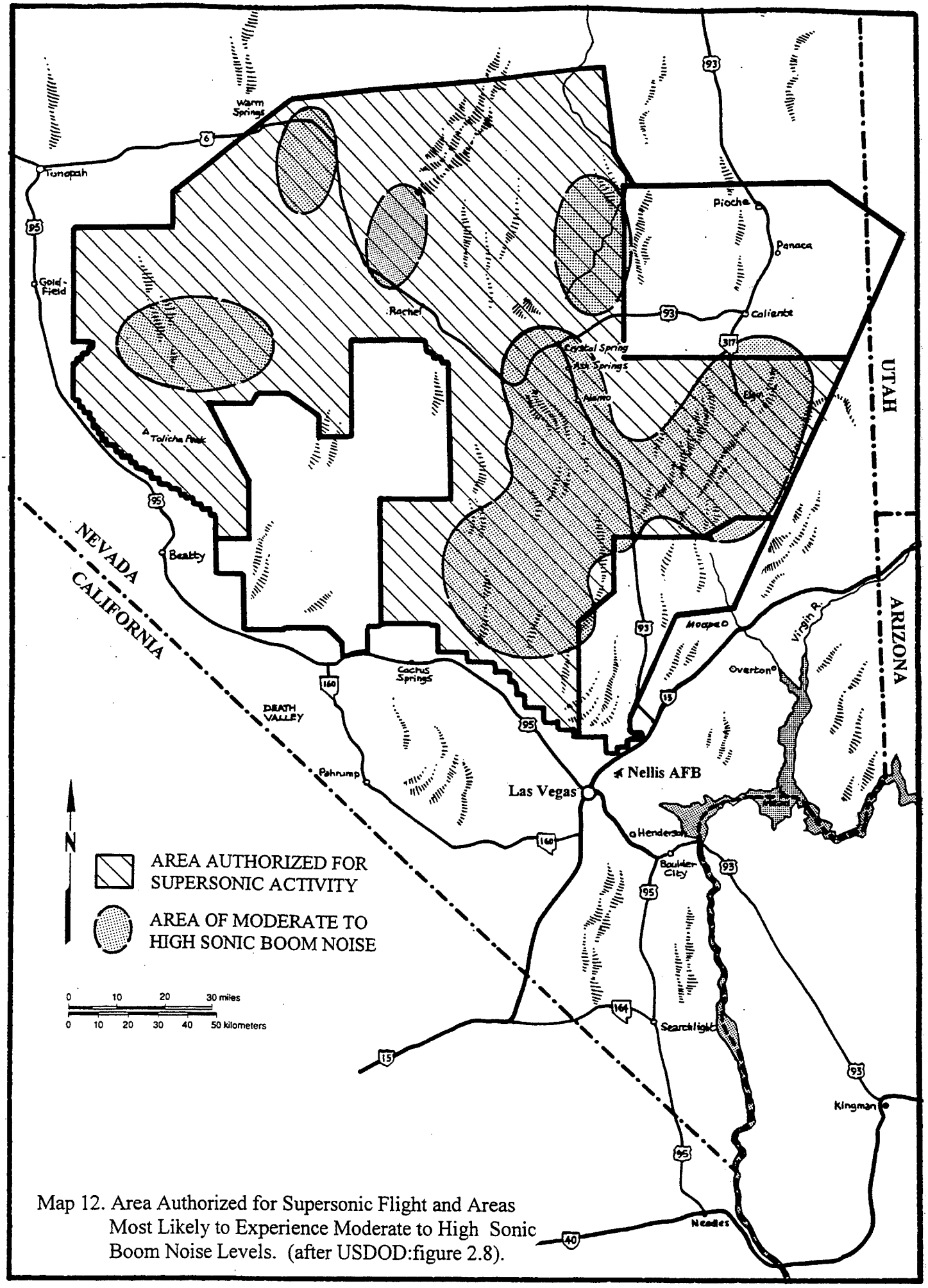
Type	Surface	0-10 cm	10-20 cm	20-30 cm
Biface Stage 3				1
Biface Stage 5	1	1		1
Decortification flake		3	1	
Core reduction flake	5	10	11	5
Biface thinning flake	1	15	12	19
Pressure flake	2	8	10	1
Broken flake fragments	3	15	6	14
Shatter	1	5	5	2
Ceramic			1	
Bone		1	9	10
Window pane glass	1			
Totals	14	15	55	63/190

6.0 SONIC BOOM EFFECTS

In definition, a sonic boom is a shock wave that results from an object moving through the atmosphere at speeds greater than the speed of sound, about 750 miles per hour at sea level. This shock wave has an overpressure signature that resembles the letter "N" (Wahba 1990). Essentially, there is an initial positive peak overpressure followed by a linear decrease to a negative peak underpressure, which is followed by a return to ambient air pressure. The surface area affected by the sonic boom is a function of both the altitude at which the aircraft is operating and the maneuvers that the aircraft is making.

U.S. Air Force bases host many sonic booms during supersonic training sorties. For example, Plotkin *et al.* (1992) recorded 591 sonic booms in a 6-month period in the Lava/Mesa airspace on White Sands Missile Range, New Mexico. Under the Plotkin *et al.* study, analysis of U.S. Air Force data showed that military aircraft spent 8 percent of their time in the military operating area at supersonic speeds. Military operations on the NAFR include supersonic activity involving F-16, F-15, F-5, F-4, and foreign military aircraft (Department of Defense 1991) (Map 12). Supersonic flights within allotted Nellis airspace in 1988 numbered 7,891, and it is projected, with a 20 percent increase in total operations, that there will be 9,469 supersonic flights in 2000. The largest number of people affected by sonic booms associated with these flights live in and around Alamo, Nevada, although this is not the only affected area. In 1990, sonic booms from military operations broke windows in Caliente, east of Alamo, Nevada (Department of Defense 1991).

Since the advent of supersonic flight, there has been much concern about the effects of impulse loading by sonic booms on humans (Rice 1996) and structures (Chen and Benveniste 1968; Crocker and Hudson 1969; Clarkson and Mayes 1972). Wahba (1990), for example, reports on the effects of sonic booms on a plaster and wood-frame wall. This study concludes that although there is observable strain (deformation resulting from an applied stress), no damage is expected from the types of sonic booms produced by current supersonic transports (no conclusions are drawn about sonic booms created by military aircraft). Interestingly, the possibility of damage is greatly enhanced when a window in a room is open as opposed to when the window is closed due to amplification of the peak impulse amplitude.



Map 12. Area Authorized for Supersonic Flight and Areas Most Likely to Experience Moderate to High Sonic Boom Noise Levels. (after USDOD:figure 2.8).

Much less work has focused on the effects of sonic booms on rock material containing prehistoric petroglyph and/or pictograph elements. Battis (1983) presents results from a study of sonic boom effects on archaeological sites in the Valentine Military Operations Area, Texas. Measurements of sonic boom and associated ground motion were made at two petroglyph sites. The first site consisted of rockshelters in rhyolite, and the second site consisted of a sandstone boulder on an alluvial fan. Ten supersonic flights were made over the two sites by F-15 aircraft flying at Mach 1.1 at altitudes of 15,000 and 20,000 feet above ground level. Of the ten sonic booms generated, only two were recorded at ground level. The sonic boom recorded at the rockshelter site had an overpressure of 0.10 pounds per square foot (psf), and the sonic boom recorded at the boulder site had an overpressure of 0.12 psf. Seismometers at the sites (placed on solid rock) recorded induced vertical and horizontal motion of the rock. Based on these experimental results, Battis (1983) concluded that sonic booms are unlikely to damage petroglyph/pictograph sites. It should be noted, however, that focused sonic boom overpressures in excess of 15 psf have been recorded during acceleration, deceleration, and tactical maneuvering by fighter aircraft flying at 10,000 to 15,000 feet above the ground (Plotkin 1993). Such overpressures are considerably higher, by a factor of 130 to 160, than those reported by Battis. Hence, Battis' (1983) study may be biased toward impacts of relatively low-pressure sonic booms.

One of the goals of this study was the assessment of possible sonic boom impacts on the four petroglyph and/or pictograph sites under consideration. An independent control site, outside of supersonic flight paths of the NAFR and overflight area, was selected for comparative purposes and to be as objective as possible in determining the effects. Meeting this project requirement involved careful visual inspection by the project geologist of physical characteristics of rock material to determine whether features at each study site are associated with natural processes or alternatively associated with impulse loading from sonic booms. The physical characteristics used to determine sonic booms impacts (predominantly looking for dissimilarities between characteristics) on petroglyph/pictograph panels included: large and small scale fractures; preservation of weathering rind (exfoliation); preservation of desert varnish; lichen coverage; rockfall debris at slope base; slope aspect; and human and hydrologic impacts. As discussed previously, all four study sites occur in a similar type of rock material, volcanic welded tuff, for consistency in comparisons.

Situated 7.5 miles northeast of Beatty, Nevada, the control petroglyph site (26NY7957) is on a north-facing outcrop of welded tuff protruding into the northeast- to southwest-trending canyon that is host to an ephemeral channel referred to as Beatty Wash. Upstream of the site, the canyon is approximately 100 m across and then narrows to a 50-m-wide constriction immediately west of the site. The east wall of the inner canyon at the narrows stands 10 m high, while the west wall is 20 m high. Local rock stratigraphy is composed of layered ignimbrite (welded tuffs) deposits with canyon walls exhibiting subvertical and subhorizontal fracturing. Much of the rock surface is covered in various degrees with desert varnish and lichen. Exfoliation has removed portions of the rock face, and fresh surfaces indicate active rockfall. The lower 1 m of the rock wall upon which five petroglyph panels have been recorded has a number of impact scars, probably the result of the movement of stream bedload during high flow. Sand, gravel, cobbles, and rounded boulders, 1 m in diameter, make up the stream channel in front of the petroglyph panels. Aside from the five petroglyph panels, a medium-density lithic scatter is situated on a bench above the panels, the lithic material probably being obtained from nearby silicate formations. A small side canyon across from the site contains a series of small step pools eroded into the rock and may have provided a limited amount of water for human use.

The independent control site is considered to be an undisturbed system that has not experienced sonic booms, at least not on a regular basis as experienced on the NAFR and overflight zone. Hence, physical characteristics of the control site are assumed to be the result of natural processes and not that of potential sonic boom impacts. The four study sites, on the other hand, have experienced and are subject to regular sonic boom activity during military training missions. Although access to the NAFR sites was allowed only during non-flight weekend days, fieldwork in the overflight zone was conducted during the week, and sonic booms were heard and sometimes physically felt by crewmembers on each of the eight field days spent at the two overflight zone sites. What follows, then, is a comparison of the sites to answer the following question: Do the physical features of the four study sites differ from those of the control site, and if so, can they be ascribed to the effects of sonic booms resulting from supersonic military aircraft flight?

In comparison, the control site exhibits vertical and horizontal fracturing of the welded tuff, as do the four study sites. Recent rockfall is found at all of the sites, although Locus I of the White

River Narrows is the only site that lacks abundant rockfall debris. Rock faces at the control site are undergoing exfoliation, as are faces at the study sites. Disturbances are present at the two NAFR sites, however, that are absent elsewhere, which probably biases the study of sonic boom effects as a result. The Civet Cat Canyon site has been affected by military activities, probably dating from the 1940s to the '60s (Myhrer 1999a). Eleven areas within the site have been identified as ordinance impact points, with one or more impact scars recognizable by the presence of fresh surface, circular, cone-shaped depressions and radiating fractures. Thought to be the marks left by inert ordnance impacts, they vary in size from about 10 cm to 1.5 m in diameter; one such projectile remains embedded in a crevice between perpendicular rock faces, with only the tail section and the bent fins protruding from the rock. It is unlikely, however, that one could separate sonic boom effects from previous military activities. Airfield Canyon has also been disturbed, but not to the same degree as Civet Cat Canyon. Airfield Canyon sits next to a mock airfield that has served as a target for military operations. Evidence of ordnance impacts as well as destroyed equipment abound on the desert floor above and immediately adjacent to the canyon site; the closest piece of equipment being approximately 1500 feet. It is possible that these impacts, as well as heavy machinery operation, have caused ground movement within the canyon, thus rendering this site unsuitable for the study of sonic boom effects. Despite the observed disturbances, none of the study sites exhibit signs of greater fracturing, weathering, or mass wasting than the control Beatty Wash site. Instead, a remarkable similarity in all aspects of analysis can be seen among all five sites.

The conclusion of the sonic boom effects objective is that there is no indication that sonic booms have contributed detrimentally to the preservation of petroglyphs and/or pictographs at the four study sites. That said, however, it is not inconceivable that sonic booms might impact such cultural resource sites. A most likely scenario would involve rock faces that are undergoing natural exfoliation. Here exposed faces are weakened by chemical weathering, and expansion of surface layers has produced hollow regions beneath the altered surface rock. We have a situation that is not unlike the room with an open window described by Wahba (1990), wherein the hollow region beneath the weakened surface would behave like a resonator, amplifying the peak amplitude of the pressure signal during a sonic boom. In areas that experience frequent sonic booms, it does not seem unlikely that these shock waves could enhance the rate at which exfoliation flakes break free from

the rock surface. It is interesting to note that Battis' (1983) measurement of vertical and horizontal motion utilized seismometers that were attached to solid rock, not chemically weathered surface layers, so they would not have detected any effects occurring within the weathered surfaces.

7.0 MODERN HUMAN-CAUSED IMPACTS

Comparable differences in cultural resource site preservation based on contrasting land management strategies is one of the objectives of this study. Impacts, both natural and human-caused, bring about cultural resource site deterioration. Such conditions generally threaten site preservation. In order to understand the differences in site preservation of the four study sites as a reflection of NAFB/NAFR and BLM land management strategies, restricted versus unrestricted access, respectively, it is necessary to restate, briefly, each agency's general mission.

During the 1940s, approximately 3.1 million acres of public lands were withdrawn from public entry to form the NAFB/NAFR. Because of the very nature of U.S. Air Force testing and training activities, large tracts of continuous rural desert land are necessary to accomplish the goals of this defense agency. Land management strategies under mission goals allow for advanced weapons training for mission-ready aircrews, operational testing and tactics development, and evaluation for all models of combat aircraft. It also provides a premier battle space environment for testing and training of the highest-caliber combat-ready crews as well as showcases airpower to the world (NAFB 1998). As a result, NAFR-controlled lands are subject to restricted public access for security and safety reasons.

In contrast, mandated by numerous federal laws, BLM administers public lands under its control in a manner that accommodates many uses. The health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations is the primary BLM mission. As such, this multiple-use strategy requires that access to public land be unrestricted (White 1998b).

Although the U.S. Air Force and BLM are mandated to adhere to the same federal cultural resource laws and regulations, it has been argued that there are differences in resource integrity or the state of site preservation between the NAFR and adjacent BLM lands (NAFB 1998). During the project's fieldwork phase, observations were made by each of the project's crewmembers for the study sites by completion of a Site Condition Form. The Site Condition Form, previously reviewed and accepted by NAFB, was designed to record the kinds of modern human-caused impacts and the degree that the site has been impacted (White 1998b). The degree of site impact was noted as being

light (little or no site impact), medium (a middle position between light and heavy site impacts), or heavy (having a number of impacts greater than both light and medium). "Modern human-caused" is here defined as impacts thought to have occurred within the last 50 years as the result of human, rather than natural, action. Observed human-caused site impacts are presented in discussion below by site.

7.1 CIVET CAT CANYON

Situated within the restricted confines of the NAFR, this cultural resource site has been heavily impacted by modern human-caused impacts, a unanimous consideration given by the crewmembers on the Site Condition Form. Aside from historic impacts to the prehistoric component of this site that includes structures, names and dates pecked into the rock faces, and refuse, the most obvious impact is the result of military activity since the 1940s. According to Bergin (1979) and York *et al.* (1996), the site was used as target 71-4 prior to the 1970s. The target was deactivated and partially cleaned (Crownover 1981); such topographic constrictions are practical for military maneuvers and target practice for low- and slow-flying aircraft (Pat Dwyer 1998, personal communication). Major Roger Schofield of the NAFR Management Office, however, recently conducted research on target 71-4 and determined that this target and another closer target, each 200-foot bomb circles, were at coordinates roughly 5½ miles north of this site in 1988. Additionally, a foot inspection of the surrounding site area did reveal that a small temporary target was located about 100 meters northwest of the site, placing the site within a larger impact zone prior to 1988 (Myhrer 1999b, electronic communications; Myhrer 1999c).

Whether target 71-4 or some unknown target was used during WWII or later, on the faces of both the east and west canyon walls are rock fracture marks thought to have resulted from medium- and large-caliber bullet and inert bomb impacts. No fewer than 18 small (5 to 10 cm) and 10 large (10+ cm) impact fractures, the largest being 1.5 m across, were noted at this site. Six of the petroglyph panels (Panels B, E, F-1, H, I, and N) are thought to have been affected by ordinance impacts. Inert bomb fragments and spent bullets are occasionally found on the ground, and a 25-pound practice bomb is wedged in a crack between two petroglyph panels. Removal of this inert

bomb, however, could cause substantial damage to the panel and has been left in place (Myhrer 1999a). While there are ordnance impacts, they are relatively minimal in terms of affecting the integrity of the recorded features.

It was also observed that a wooden structure may have existed at one time on top of the west canyon wall. This structure no longer exists, and the remains are partially buried on the north side of the mesa. Although the majority of the historic refuse at the site is of a pre-1940 context, a few cans of modern origin, with extant paper or applied labels, are scattered about. Other than a few recent cans and ordnance impacts, the site does not appear to be affected by modern vandalism such as the defacing of petroglyph panels with offensive material or artifact collectors' piles, likely a result of the security restrictions on access.

7.2 AIR FIELD CANYON

Also situated within the access-restricted confines of the NAFR, the Airfield Canyon site is quite dissimilar to the Civet Cat Canyon site in its degree of preservation. Despite its closeness (within 1500 ft.) to an established target used for inert ordnance drops, this site has suffered little from modern human-caused impacts and received a unanimous "light" degree of site impact rating from crewmembers. A few ordnance items are found on the floor of the canyon site, but their location is probably the result of surface water runoff rather than inadvertent target misses. A couple of soda pop cans were noted on the occupation bench, left from an occasional site visitation. Evidence of modern vandalism, however, is not present at the site in any form. A moderate effort must be made to access the site from established roads and target features. The Airfield Canyon site is extremely well preserved, both in quantity and quality of resources.

7.3 WHITE RIVER NARROWS

All three of the White River Narrows loci are situated within or immediately adjacent to the current State Route 318 right-of-way. Collectively, the loci have been heavily impacted due to public access. Two petroglyph panels at Loci I and a non-panel situation at Loci II contain impact marks (1 to 3 cm) thought to have originated from being shot with small caliber weapons. The area

in front of Locus II has been used by the Nevada Department of Transportation as a material storage yard for highway repairs. Loci II and III have been the focus of vandalism in the form of spray painting on rock surfaces (one non-petroglyph panel) or over petroglyph elements (one petroglyph panel). Removal of the paint was accomplished in the early 1990s in an effort to discourage additional vandalism with success at these loci (Mark Henderson 1998, personal communications; Susan Murphy 1998, personal communication). Despite the best intentions of the paint removers, however, the methods used further damaged the rock face by extracting substrate rock particles along with the paint, resulting in visible changes in the surface rock coloration and/or texture. In addition to spray painting, modern names and dates have been scratched or pecked into some of the prehistoric petroglyph/pictograph panels. These are most evident at Locus I and particularly, Locus III, immediately adjacent to State Route 318. Stone rings associated with campfires have been built in the vicinity of Locus II, and modern refuse, although limited in quantity, is present at all three loci. Because of the unique character of the rock material upon which the pictographs of Locus II have been painted, rock samples have been extracted by coring and hammer removal, leaving visible damage on one corner of a pictograph panel. The chalking of some petroglyph elements, a common practice by some uninformed photographers to enhance the designs, has occurred at Loci I and III. Finally, because the Narrows are known for their petroglyphs and are marked so on some popular maps, the cultural resource sites within the canyon receive high public visitation.

7.4 RED PIGMENT CANYON

Not readily accessible, an intentional effort has been made to access this site by use of a two-track road and cross-country foot travel; the Red Pigment Canyon site is in a relatively good state of preservation because of its topographic location. It probably does not receive a high rate of public visitation. The crew judged the site as having light impact, while the surrounding area was rated at a medium impact. During the first day of work at this site, three men were encountered and are thought to have been collecting or looking for surface artifacts until interrupted by the recording crew. They had accessed the area by all-terrain vehicles. Diagnostic surface artifacts previously identified in 1997 by the principal author on the apron of the Red Pigment Canyon rockshelter no longer existed in their context. Evidence of unauthorized excavation at two nearby rockshelters and

collector's piles at several loci suggest that surface and subsurface collecting of artifacts poses an ongoing impact to this highly sensitive archaeological complex. A few nearby locations have been established as weekend camping spots complete with stone fire rings. Bullet and shotgun casings suggest that the general area is used for recreational sport hunting. Fortunately, none of the petroglyph panels in the canyon have been impacted by gun shots. Modern graffiti spray painting or names and dates are not present at this site, as seen in the White River Narrows. A limited amount of modern refuse is confined to camping areas away from the canyon site.

8.0 PETROGLYPH AND PICTOGRAPH ELEMENT ANALYSIS

Study site documentation resulted in the recording of 106 petroglyph and/or pictograph panels. Depicted on those panels were 868 identifiable elements. It must be remembered that while a panel design may contain numerous elements in combination, a panel may also be comprised of a single element in isolation. Elemental analysis may tell us something about the types of elements used in design composition and the percentages of element types expressed, and may help in defining particular styles represented at a site. Particular styles have temporal as well as cultural definition, making them important in the study of petroglyphs/pictographs.

Post-field analysis of the recorded designs and individual elements was accomplished by comparing field drawings and descriptions with photographs of each panel for accuracy. Documented designs were broken down into their smallest unit, the element, and tallied in general categories based on shape, each general category having numerous analytical types (e.g., connected circles, grid, rake with wavy tines, mountain sheep). General categories of analysis included abstract curvilinear, abstract rectilinear, abstract elements comprising both curvilinear and rectilinear lines, and representational elements for petroglyphs. Scratched patterns, all shapes, were lumped together under their own category as were all pictograph and historic/recent petroglyph elements. The resulting breakdown in general categories, element type names, representative symbol, count, and distribution by study site is presented in Appendix A; element counts and percentages by general categories are presented in Table 7. Names used to characterize element types are descriptive terms that delineate particular word/symbol associations familiar to the study field and/or American culture and are not intended as terms of interpretation or function. Analytical categories and element types used in this study are roughly equivalent to similar studies and allow ease of comparison between sites from widely different localities (see Heizer and Baumhoff 1962; Whitley 1998).

As a word of caution, even though the analytical categories and element types used here are similar to other studies, the process is subjective and debatable. Other researchers using the same field data may or may not categorize the information differently, dependent upon research goals. For example, where one researcher might classify a bisected circle as being a curvilinear abstract element, it is here classified as a representational element, a vulvaform. Despite the subjectivity of

the process, it is felt that the general conclusions offered here would be reached and conceded by other researchers.

Table 7. Counts and Percentages of Element Types by General Analysis Category

Category	Civet		Airfield		WRN-I		WRN-II		WRN-III		Red	
n=/percentages	n	%	n	%	n	%	n	%	n	%	n	%
Curvilinear	52	45.2	80	66.1	102	32.5	0	0.0	2	3.6	27	23.9
Rectilinear	21	18.3	14	11.6	102	32.5	0	0.0	7	12.7	22	19.5
Combination	4	3.5	8	6.6	11	3.5	0	0.0	0	0.0	4	3.5
Representational	7	6.0	3	2.5	60	19.2	0	0.0	4	7.3	56	49.6
Scratched	11	9.6	12	9.9	10	3.2	6	4.0	5	9.1	0	0.0
Pictographs	0	0.0	4	3.3	3	<1	141	93.3	9	16.4	4	3.5
Historic	20	17.4	0	0.0	25	8.0	4	2.7	28	50.9	0	0.0
Totals	115	100	121	100	313	100	151	100	55	100	113	100

WRN = White River Narrows

Working definitions are appropriate here. Elements of a curvilinear abstract shape are figures that are based primarily on curved lines such as circles, arcs, dots, and wavy or meandering lines. Rectilinear elements are characterized by straight lines such as grids, chevrons, crosses, diamonds, and triangles, to name a few. Combination elements are images that comprise curvilinear and rectilinear lines–for example, a horizontal straight line with hanging or mounted arcs. While rectilinear and curvilinear shapes are usually considered geometric abstract patterns, straight and curved lines can also be used to form representational elements or images that are thought to represent a definitive natural or cultural phenomenon. Such representational elements can include, but are not limited to, human-like (anthropomorphs), animal-like (zoomorphs), plants, weapons, and vulva-like, or fertility symbols. These abstract and representational elements can be expressed as petroglyphs and/or pictographs.

Based on the element analysis and tallying presented in Table 7, some interesting distributions are apparent. Focusing first on prehistoric petroglyphs, curvilinear abstract elements occur in greater percentages at Airfield Canyon (66.1 percent) and Civet Cat (45.2 percent)

compared to White River Narrows Locus I (32.5 percent) and Red Pigment Canyon (23.9 percent), portrayed graphically in Chart 1. Rectilinear abstract elements are almost equal to curvilinear elements at White River Narrows Locus I (32.5 percent), slightly less at Red Pigment Canyon (19.5 percent), and of a lower percentage at Civet Cat (18.3 percent) and, particularly, Airfield Canyon (11.6 percent). The only place where the difference in relationship between curvilinear and rectilinear elements is reversed is at White River Narrows Locus III, where rectilinear (12.7 percent) are greater than curvilinear (3.6 percent) elements. Because the combination category comprises elements containing both rectilinear and curvilinear characteristics, and because the elements are so few in number, they are not further discussed. Additionally, because of the small number of prehistoric elements depicted at White River Narrows Locus III, the tallies are added to the White River Narrows Locus I for further consideration. Table 8 indicates an amalgamation of abstract petroglyphs (rectilinear, curvilinear, and the combination category) in relation to representational petroglyph elements and all other categories combined (i.e., scratched, pictographs, historic).

Representational petroglyph elements occur with greatest frequency at Red Pigment Canyon (49.6 percent) and in descending order at White River Narrows Locus I (19.2 percent) and Locus III (7.3 percent), Civet Cat (6 percent), and the least at Airfield Canyon (2.5 percent) (see Table 7). Based on Table 8, Chart 2 depicts the relationship between combined rectilinear and curvilinear abstract petroglyph elements compared to representational designs identified at the four study sites. As can be seen from Table 8 and Chart 2, used later in addressing specific posed research questions, representational elements at Red Pigment Canyon are three percentage points higher than the combined abstract elements, each category representing or nearly expressing 50 percent of the total petroglyph assemblage, making this a unique site in comparison with the other three locations, where abstract elements outnumber representational forms. Depictions of mountain sheep occur with greatest frequency at Red Pigment Canyon (number [n]=26) and White River Narrows (n=8), and to a far lesser extent, at Civet Cat (n=2) and Airfield Canyon (n=1), with deer/elk being embodied once each at the two BLM sites (Appendix A).

Chart 1. Percentages of Petroglyph Types by Analysis Category

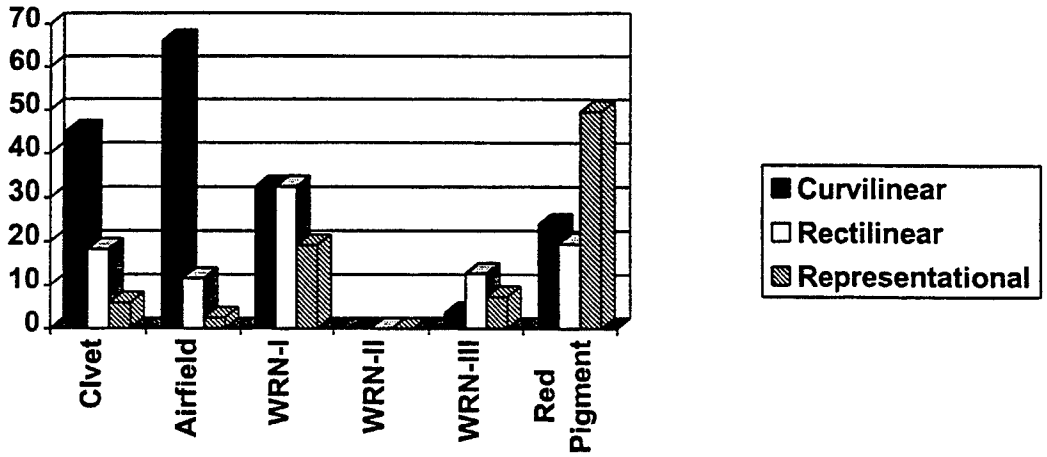
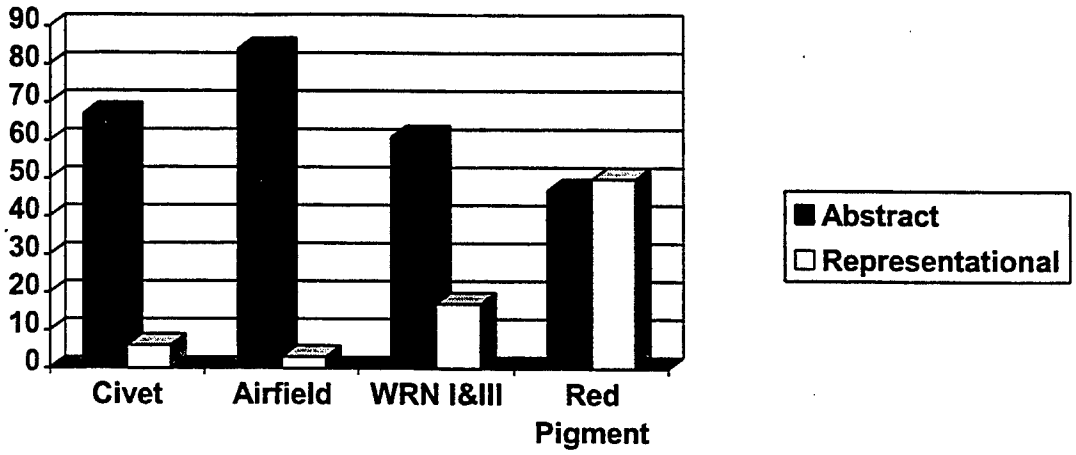


Table 8. Counts and Percentages of Abstract, Representational, and All Other Categories

Category	Civet Cat		Airfield		WRN-I&III		Red Pigment	
N= / Percentage	n	%	N	%	n	%	n	%
Abstract	77	67	102	84	224	61	53	47
Representational	7	6	3	3	64	17	56	50
All others	31	27	16	13	80	22	4	3
Totals	115	100	121	100	368	100	113	100

N = number
WRN = White River Narrows

Chart 2. Percentages of Combined Abstract vs. Representational Petroglyph Elements



All forms of anthropomorphs occur with more frequency at the White River Narrows (n=19), followed by Red Pigment Canyon (n=10), with a disparity of human-like forms at the two NAFR sites, Civet Cat having two and Airfield Canyon none. Red Pigment Canyon was the only site to contain the unique Pahranagat patterned body anthropomorphs (n=4). A disparity in the frequency of vulva-like symbols also exists on the two NAFR sites, only one being noted at Airfield Canyon, while the White River Narrows have 15 and Red Pigment Canyon 9. It is also interesting to note that foot/pawprint elements are depicted only at the White River Narrows (n=10) site. One archer was documented at Red Pigment Canyon, and atlatls are present at Civet Cat Canyon (n=1), White River Narrows (n=1), and Red Pigment Canyon (n=2) only.

Prehistoric scratched elements are present at Civet Cat, Airfield, and all three loci of the White River Narrows, but were not identified at Red Pigment Canyon. At those sites and loci where scratching was documented, scratched elements represented 10 percent or less of the total assemblage for each location (Table 7). Rectilinear scratched forms, vertical, diagonal, and horizontal lines outnumber curvilinear forms such as circles, wavy lines, and figure eights (Appendix A). The most common scratched shape was that of short, multiple, vertical lines and was depicted at the listed sites and loci, with 20 occurrences recorded. Representational elements were not depicted by scratching. Neither was scratching documented as an attempt to obliterate any other

design, as is the case with some petroglyph sites (see Bettinger and Baumhoff 1982). Also, attempts failed to determine superpositioning when scratching was present with petroglyphs, except for a few instances at Locus I, White River Narrows, where some scratching is seen as post-dating the petroglyphs.

Initially called for in the project scope of work, pictographs were included in site selection because of their potential ability to address chronometric-related issues through pigment sample collection and analysis. Of the four study sites, pictographs were determined to be present at Airfield Canyon; White River Narrows Loci I, II, and III; and Red Pigment Canyon. All of the documented elements are abstract, with no recognizable representational forms being depicted (Appendix A). Not previously detected by Crownover (1981) and York *et al.* (1996), faint traces of red paint were discerned on Panels D and K at Airfield Canyon depicting some undetermined amorphous shape. Faint traces of red paint are also found in the pecked body cavities of three anthropomorphs at Panels K and L, White River Narrows Locus I. A set of four concentric circles, opposing rings to five concentric pecked circles, and three amorphous shapes are depicted at Red Pigment Canyon. In comparison to the petroglyph sites, however, Locus II, White River Narrows, is unique for its pictographs and lack of petroglyphs. Depicted at this location is a minimum of 83 sets of red painted marks created by dragging the first 3 fingers of a hand dipped in paint across the smooth, dark rock surface, as well as additional abstract elements in far lesser counts.

Lastly, with the exception of the Airfield and Red Pigment Canyon sites, historic elements occur at Civet Cat and at all three loci of the White River Narrows, either in pecked or scratched form. The presence of names, initials, and/or dates at these two canyon sites is the direct result of the canyons being used as travel corridors during historic and recent times and the urge of people to mark their passing. Most certainly names and dates dominate element counts, but words or phrases such as "NO HORSES" depicted at the White River Narrows, a zoomorph (cow's head in frontal view) at Civet Cat, a specific town, and a swastika with "WHITE" above it attest to the limited imagination of historic/recent travelers given the iconic palette of our society (Appendix A). While 1997 appears to be the most recent and 1909 the oldest at White River Narrows Locus III, the oldest at Civet Cat is 1908, and the most recent was some time in the 1960s, as represented by letters "196" (1947 is the last recognizable date). Not present at any of the study sites were obvious

indicators that Indian people created historic period petroglyphs or pictographs, as might be suggested by horse and rider representational elements, despite their known presence in the study areas during historic and ethnographic times.

8.1 STUDY SITE STYLES

Hedges (1982:210) stated in a re-evaluation of Great Basin petroglyph/pictograph styles that there is the "presence of a widespread and ancient rock art tradition which underlies a wide variety of rock art styles throughout the American west and is responsible for the sometimes baffling similarities which are noted over a vast geographical area." Generally, the greater part of the Great Basin petroglyphs and some pictographs are thought to be associated with Western Archaic groups. In eastern and southeastern Nevada, Basketmaker and later Fremont and Virgin Anasazi people contributed to the stylistic inventory after A.D. 1 (Schaafsma 1986). In their classic study, Heizer and Baumhoff (1962) defined six generalized petroglyph/pictograph styles that include: Pit-and-Groove; Great Basin Pecked Abstract, subdivided into Curvilinear and Rectilinear Abstracts; Great Basin Representational; Great Basin Painted; Great Basin Scratched; and Puebloan Painted Style. To this list of styles Ricks (1996) added Great Basin Carved, a style identified well to the north of the current study and one that may be particular to that area. A localized style, the Coso Representational is unique to the Coso Range of California and is defined in Grant *et al.* (1968). Another style of limited distribution and minimal definition is the Pahranagat Representational. The Pahranagat Representational, first noted by Heizer and Hester (1974), appears to be unique to the Pahranagat Valley and is hallmarked by anthropomorphs having rectangular-shaped bodies with stylized internal designs and anthropomorphs with rectangular, solid-pecked bodies. Both the Coso and Pahranagat Representational Styles appear to be anomalies in the Western Archaic tradition (Christensen *et al.* 1998).

Based on element analysis presented above, the four study sites can be classified according to Heizer and Baumhoff's (1962) generalized petroglyph/pictograph styles. The Civet Cat Canyon study site contains a high percentage of curvilinear abstract elements (45 percent) compared to rectilinear abstract (18 percent) to representational (6 percent), scratched (10 percent), pictographs

(0 percent), and historic elements (17 percent) (see Table 7). Combined, the abstract elements (67 percent) outnumber all other categories (33 percent) (see Table 8) and can essentially be characterized as being representative of the Great Basin Abstract Style, emphasis on the curvilinear abstract subdivision, associated with the Western Archaic. This analysis supports stylistic conclusions previously derived by York *et al.* (1996).

Airfield Canyon is similar to Civet Cat Canyon in stylistic expression, with curvilinear abstract elements (66 percent) again appearing with greater frequency than rectilinear abstract elements (11 percent) (see Table 7). Of the four study sites, Airfield Canyon has a greater percentage of combined abstract elements (84 percent) than all other types of depictions (16 percent) (Table 8). It can be concluded that this site is a good representative of the Great Basin Abstract style with emphasis on the curvilinear subdivision. Elemental analysis here supports general stylistic conclusions offered previously by York *et al.* (1996) for this site.

Loci I and II of the White River Narrows express a higher percentage of representational elements (17 percent) than depicted at Civet Cat (6 percent) and Airfield Canyon (3 percent) (see Table 8). Despite this, combined abstract elements (61 percent) at the loci outnumber representational examples (17 percent) (see Table 8), with rectilinear elements equal to or slightly more common than curvilinear elements (see Table 7). Although there is a high percentage of abstract elements, this site is characteristic of the Great Basin Representational Style. Particular elements such as hand and foot prints, linear and clustered dot patterns, sawtooth elements, and, particularly, solid-pecked, stylized, triangular or trapezoid-body anthropomorphs, some with headdresses, suggest that the White River Narrows petroglyphs are Fremont-influenced.

Unique to the White River Narrows, Locus II is essentially comprised of pictographs that are fundamentally abstract in depiction and interpretation. Heizer and Baumhoff (1962:207-208) define Great Basin Painted Style as consisting of "circles and parallel lines done in red and white," while the diagnostic element of the Puebloan Painted Style is stylized anthropomorphs. Although Heizer and Baumhoff (1962) analyzed few pictograph sites, they did recognize that the painted style probably had a wider distribution than attested to by their study. Because it lacks anthropomorphic depictions and consists primarily of abstract symbols, it stands to reason that this is typical of a Great Basin Painted Style site. Without chronometric dating of the pictographs, the temporal position and

cultural affiliation cannot be made. Additionally, both painted styles need additional research to define characteristic attributes and spatial distribution. Only then can a particular style be applied to this locus.

Red Pigment Canyon is unique among the study sites in relationship to the percentage of abstract to representational elements. Based on Table 8, representational elements (56 percent) are slightly more common than combined abstract elements (53 percent). Clearly this site would fall within the Great Basin Representational Style that also includes abstract designs, but because of the presence of Pahranagat patterned body anthropomorphs, it is here characterized as belonging to the Pahranagat Representational Style. Both similar and dissimilar in many respects to the Coso Style, which is heavy in representational elements, the true constitution of this style remains to be thoroughly studied and defined. Because of its location within the Puebloan/ Fremont zone of influence and the depiction of atlatls in the hands of Pahranagat-style anthropomorphs, it is possible that Basketmaker people created the depictions but were also heavily influenced by the abstract designs of the Western Archaic.

9.0 CHRONOLOGICAL RESULTS: RELATIVE AND ABSOLUTE

Study site chronology is based on a culmination of evidence. This includes collected and/or observed lithic artifacts, radiocarbon-dated charcoal samples, an observed ceramic sherd, temporally sensitive petroglyph elements, and petroglyph/pictograph styles as relative chronological markers. It must be remembered that the cultural material and C-14 dates discussed below are spatially associated with petroglyph/pictograph panels and do not directly date the images themselves. The derived chronologies suggest a range of time in which the sites could have been occupied and the observed images created.

9.1 LITHIC ARTIFACTS

Four lithic artifacts were collected, two from Civet Cat Canyon and two from Airfield Canyon, as originally called for in the project's scope of work, outlined in the Implementation Plan (White 1998b), and allowed by NAFB in fulfillment of project objectives. The artifacts were initially collected for the purpose of obsidian sourcing and hydration analysis to obtain chronometric dates that may have contributed to the chronology of the study sites. Obsidian hydration and sourcing tests were, however, not conducted on the artifacts at the request of NAFB and will be returned to the NAFR with Native American assistance and guidance (Myhrer 1999a).

Lacking chronometric age determinations obtained from hydration analysis, the following discussion is based on point chronologies, expressed in relative ages, formulated by Thomas (1981), Fowler and Madsen (1986), Jennings (1986), and Warren and Crabtree (1986). It must be remembered that within any given Great Basin research area, the type of projectile points present, their frequency, and temporal association can, and often do, vary from area to area. Additionally, without specific hydration dates or the recovery of points from carefully controlled subsurface stratigraphic sequences, the following discussion can at best represent only generalized temporal site interpretations based on diagnostic lithics.

Manufactured from obsidian, broken fragments of a Gatecliff Contracting Stem and Elko-Eared or Corner-Notched projectile points were collected from the Civet Cat Canyon study site.

Working with projectile points associated with the Monitor Valley of Nevada, Thomas (1981:22) suggests that the Gatecliff Series of points occur between 3000 and 1300 B.C., the Gatecliff Series being an amalgamation of the Elko Contracting Stem and the Pinto Series. Fowler and Madsen (1986:174, Table 1) essentially agree with Thomas' earlier range end but extend the latter end to roughly A.D. 1 for the Pinto/Gatecliff points. Warren and Crabtree (1986:184), however, argue for earlier dates for points associated with the Pinto Period ranging from 5000 to 2000 B.C., while Jennings (1986:117, Figure 3) implies a larger range from approximately 6500 to 500 B.C. Three of the four cited authors propose that use of the Gatecliff (Pinto) points extended past Warren and Crabtree's 2000 B.C. date, the latest being A.D. 1. At the same time, Jennings places the Gatecliff Series at 1,500 years earlier, while Fowler and Madsen and Thomas are 2,000 years later than Warren and Crabtree's front end date. Since Thomas (1981), Fowler and Madsen (1986), and Warren and Crabtree (1986) were working in or referring to specific areas within the Great Basin, and Jennings (1986) represents Great Basin generalizations, it is safe to assume that Jennings' generalized sequence clearly encompasses the date of manufacture and subsequent use of the Civet Cat Canyon Gatecliff point fragment.

There is less disagreement among the cited authors over the relative age range applied to the Elko Series of projectile points. For instance, both Jennings (1986) and Fowler and Madsen (1986) assume a long-lived point type ranging from 6000 B.C. to A.D. 1000. Although significantly shorter in duration, Thomas (1981) and Warren and Crabtree (1986) are in nearly similar agreement with 1300 B.C. to A.D. 700 and 2000 B.C. to A.D. 500 relative age ranges, respectively. The former age range, 6000 B.C. to A.D. 1000, can be generally applied to represent the date of manufacture and subsequent use for the Elko-Eared or Corner-Notched point recovered from the Civet Cat study site.

Although numerous obsidian tools were present at Airfield Canyon, broken fragments of a Gatecliff Split Stem and a Great Basin Western Stem were collected because of their recognizable point type attributes, which were lacking with other observed artifacts. As discussed above, the Gatecliff Split Stem collected from the Airfield Canyon site was probably manufactured and subsequently used some time between 6500 and 500 B.C., a period of 6,000 years. Thomas (1981) does not present any data for the Great Basin Western Stemmed points, but Jennings (1986) indicates the series as ranging from roughly 9000 to 6000 B.C. Considered ancestral to the early Archaic

cultures of the Pinto period as expressed in the Gatecliff series points, Warren and Crabtree (1986) express a relative age range of 10,000 to 5000 B.C. A third range of approximately 6000 to 4000 B.C. is presented by Fowler and Madsen (1986) based on work in eastern Nevada. Great Basin Stemmed points probably range in age from 10,000 to 4000 B.C., which is used here as the period in which the Airfield stemmed point fragment was made, subsequently used, and discarded or lost.

Even though not collected or manufactured from obsidian, a complete Eastgate Series point that can add to the temporal interpretation was previously observed on the apron of the rockshelter at the Red Pigment Canyon (archived site form). Thomas (1981:19) combines both the Rose Spring and Eastgate point types under the term of Rosegate Series and provides a temporal range of A.D. 700 to 1300 for this point type. Under Warren and Crabtree's (1986) cultural sequence, the Rosegate Series is equated to the Saratoga Springs Period ranging from A.D. 500 to 1200. Both Jennings (1986) and Fowler and Madsen (1986) essentially agree on an A.D. 1 to 1500 range for this style of projectile point, being smaller in size than previous ages and indicative of the bow and arrow rather than atlatl and dart configuration. The A.D. 1 to 1500 is used here as the temporal span for the previously recorded Red Pigment Canyon projectile point.

Generally, based on analysis of surface artifacts, both the Civet Cat and Airfield Canyon sites exhibit great antiquity, while Red Pigment Canyon is younger in relative age. Based on the four collected obsidian point fragments and the single previously recorded occurrence, Airfield Canyon denotes the oldest relative age (10,000 to 500 B.C.), followed by Civet Cat Canyon (6500 B.C. to A.D. 1000), and finally Red Pigment Canyon (A.D. 1 to 1500). Since no projectile points were observed at the White River Narrows, relative ages cannot be suggested for this study site using this method. As a word of caution, as presented here this discussion does not consider adaptive reuse of points by later temporal period cultures. There is also the possibility that a much larger and variable assemblage of points has been collected over the years from all of the sites, biasing any kind of interpretation.

9.2 OBSERVED CERAMIC ARTIFACT

A single ceramic sherd, corrugated Moapa Gray Ware, was identified during a subsurface

test probe at Red Pigment Canyon. A mixture of Virgin Anasazi, Fremont, and Paiute ceramics abounds in the area surrounding Red Pigment Canyon. It is probable that Virgin Anasazi visited the area for resource exploitation or may have traded their ceramic wares into the area that was occasionally occupied by Fremont groups (this interaction remains to be studied in this area of Nevada). Moapa Gray Ware originated in the Moapa Valley of Nevada, and Lyneis *et al.* (1989) argues that its development and use dates from A.D. 950 to A.D. 1150. Fowler and Madsen (1986) extend its use to A.D. 1200.

9.3 COLLECTED CHARCOAL

A total of three charcoal samples was collected from probe units, one from Airfield Canyon and two from the White River Narrows at Loci II and III. All of the samples were submitted to Beta Analytic, Inc., for standard radiometric analysis. Beta's determinations are presented in Table 9 by conventional radiocarbon age and at the 1 and 2 sigma-calibrated results, or 68 percent and 95 percent probability levels, respectively, expressed as ranges (refer to Appendix B). C-14 age of each sample is based on uncalibrated radiocarbon years BP, the present equaling A.D. 1950. The 2 sigma-calibrated age range is recommended by Beta Analytic and used here as the basis of sample interpretation. Again, the collected samples were to be used in helping establish a chronology of site use and are not necessarily associated with cultural manifestations.

Table 9. Conventional Radiometric and Calibrated Dates for Three Charcoal Samples

Site/Dates	Conventional C-14	68% Probability (1 sigma)	95% Probability (2 sigma)
Airfield Canyon	2190 ± 140 BP	390 to 40 B.C.	530 B.C. to A.D. 100
WRN, Locus III	470 ± 60 BP	A.D. 1420 to 1460	A.D. 1400 to 1515
WRN, Locus II	Post-0 BP	A.D. <1950	A.D. <1950

Recovered from a depth of roughly 23 cm below the surface in the northwest corner of Probe Unit 1, the Airfield Canyon charcoal sample, Beta-123681, possibly represents a portion of a

culturally derived hearth feature situated in front of the rockshelter. (Expansion of the probe unit was not made, and the definition of the ashy layer as a hearth feature remains unresolved.) The 2 sigma range for this feature is reported at 530 B.C. to A.D. 100. A fluctuation in the calibration curve and interception with the upper 2 sigma range of the radiocarbon age resulted in a narrow outside 2 sigma-calibrated date range of 745 to 700 B.C. (refer to Appendix B). Fluctuations in the analytical curve are a reflection of numerous small-scale variations in past atmospheric C-14 content measured in the sample (Dehling and Van Der Plicht 1993; Talma and Vogel 1993).

Although recovered from a suspected hearth deposit at a depth of 7 cm below the surface, the result of the White River Narrows Locus II sample, Beta-125115, is reported as being 101.9 ± 0.9 percent of the reference standard, 100 percent being 0 B.P. years old, or A.D. 1950. Beta Analytic (1999) states that the "analyzed material contained an average C-14 content which was greater than the modern standard" and that "it indicates the carbon analyzed included atmospheric '[atomic] bomb carbon' generated within the last 40 years." Whether this suspected hearth feature exposed as a result of the test probe is prehistoric, historic, or modern in age cannot be determined. It is possible, however, that this buried cultural feature is prehistoric or historic in age, but was contaminated with "bomb carbon," the site being downwind from the Nevada Test Site, as a consequence of rodent activity. Unfortunately, this data does not contribute to the age determination or interpretation of this site and stresses a red flag warning of potential "bomb carbon" contamination of any archaeological carbon sample collected from "downwind" cultural resource sites in Nevada.

The last sample to be discussed, Beta-125116, was recovered from White River Narrows Locus III directly below the petroglyph panel at a depth of 30 cm below the surface. Because of the location adjacent to the rock face, the limited horizontal distribution of charcoal, and partially burnt plant material fragments, this feature is thought to represent a burnt bush rather than a cultural feature such as a hearth. Sample radiocarbon age is reported at 470 ± 60 B.P., while the 2 sigma-calibrated results figure a range of A.D. 1400 to 1515. As with the Airfield Canyon sample, this charcoal specimen also had a split 2 sigma-calibrated date to the outside and ranged at A.D. 1585 to 1625. This split date, indicating a fluctuation in the calibration curve and intercept (see Appendix B), may be the result of contamination by the introduction of later charcoal material as part of rodent activity. Even though it is thought that this feature is the remains of a burnt bush

rather than a cultural hearth feature, it is nevertheless significant as it shows that sediment deposition is an active process at this location, 30 cm in the last 500 to 600 years. This fact helps explain why prehistoric petroglyph elements are situated near the present ground surface and that there is a potential for buried cultural materials below the 50-cm probe conducted in this study. Additional probe levels below the 50-cm level were not made at the time due to a lack of cultural material or definitive, encouraging stratigraphic profiles in the preceding levels.

9.4 TEMPORALLY SENSITIVE PETROGLYPH ELEMENTS

The depiction of certain recognizable temporally sensitive petroglyph elements, such as the atlatl, bow and arrow, and horse-mounted men, as well as rare projectile point styles (Thomas and Thomas 1972), can provide valuable archaeological clues to the relative age of an individual panel or petroglyph site. Recognized styles produced by a particular cultural group can also provide a site's relative chronology. Elements, either in stylistic or time-sensitive representation, capable of affording relative ages were noted at three of the four study sites, Airfield Canyon being the exception. A single atlatl is depicted on Panel G at Civet Cat Canyon, and a hooked and weighted atlatl is depicted on Panel A, White River Narrows, Locus III. The latter atlatl is also decorated with red pigment along its edges. A barely visible hooked atlatl, Panel J, and a weighted atlatl being held by a Pahranagat patterned body anthropomorph, Panel K, are found at the Red Pigment Canyon site. Also identified at Red Pigment Canyon is a bow and arrow held by an archer, Panel P. Making hunting more efficient, the bow and arrow is thought to have generally replaced the atlatl as a hunting tool in the southwestern portion of the Great Basin between 290 B.C. and 500 A.D. (Warren and Crabtree 1986). Thus, the depiction of the atlatl at the three sites is thought to have occurred prior to the terminal date of 500 A.D., and the creation of the archer was some time after the 290 B.C. initial date.

Superpositioning, or the layering of petroglyph elements over other depictions, can provide relative chronologies at sites where such events occur (Woody 1997). Superpositioning of elements establishes a sequence of youngest to oldest as a measurement of relative age, but not how old or how young the elements are in absolute age. Only a limited number of superpositioned elements

occur at the study sites. A mountain sheep is pecked over a curvilinear abstract element on Panel T at Airfield Canyon. The presence of this single sheep element, the only one recorded at Airfield Canyon and one of three representational elements, suggests that representational forms are later expressions than the curvilinear elements that dominate the site. At Locus I in the White River Narrows, there are a few instances of incised geometric lines placed over representational and other geometric patterns. Obvious time differentials occur at two study sites where historic names and dates are occasionally pecked over prehistoric elements. No definitive statements can be made, however, concerning relative chronology based on superposition due to a general lack of such occurrences at the study sites (see Woody 1997).

9.5 STYLE AS A TEMPORAL INDICATOR

As previously noted, dating is a major concern in petroglyph/pictograph studies. Efforts have been made by various researchers using traditional methods providing relative dates and, more recently, chronometric techniques that have given more precise dates. Julian Steward (1929) perceived a relative chronology of curvilinear followed by rectilinear and then representational petroglyph elements in the Great Basin. Heizer and Baumhoff (1962) took the chronology one step further by adding dates and creating additional stylistic categories. The two researchers used subjective observable data including differences in patination, designs covered by deposits, designs associated with archaeological deposits, and the superposition of elements to form the basis of their chronology. Their analyses resulted in the following chronology for the various defined styles (Heizer and Baumhoff 1962:233-234):

- Pit and Groove - 5000 B.C. to 3000 B.C., being the oldest of their styles
- Great Basin Curvilinear Abstract - 1000 B.C. to A.D. 1500
- Great Basin Rectilinear Abstract - A.D. 1 to A.D. 1500
- Great Basin Representational - A.D. 1 to A.D. 1500
- Great Basin Scratched - A.D. 1000 to ??
- Great Basin Painted - A.D. 1000 to ??
- Puebloan Painted - A.D. 500 to A.D. 1150.

They were quick to state, however, that the dates were tentative and uncertain and with presage, "...it would seem that this must always be so with petroglyphs" (Heizer and Baumhoff 1962:233).

Working in the Coso Range of California, Grant *et al.* (1968) suggested that the Coso Representational Style dated from 1000 B.C. to A.D. 1000. Divided into three phases, their dates were based on the presence or absence of the bow and arrow in relation to atlatl depictions. Using similar reasoning, Heizer and Hester (1974) suggested dates from 300 B.C. to A.D. 500 for the Pahranagat patterned body anthropomorph because they are depicted occasionally holding atlatls, or separate atlatls are depicted on the same panel. Schaafsma (1986) suggests areas that have cultural associations with the Virgin-Kayenta Anasazi will have petroglyphs/pictographs dating from A.D. 700 to A.D. 1150 and with the Fremont, A.D. 750 to A.D. 1300.

Others have argued for older dates (see Thomas and Thomas 1972; Schaafsma 1980), and recent direct dating may demonstrate them to be correct. Dorn and Whitley (1983, 1984) began precise dating of five Coso Range petroglyph elements, one representational, one rectilinear, and three curvilinear elements, using cation-ratio analysis of desert varnish patination. They concluded that their results should be considered provisional given the small number of samples, that the dates were twice as old as previously hypothesized, and that the dates were the only ones based on an objective dating method (Dorn and Whitley 1983).

Later, Whitley and Dorn (1987) expanded their sample size and used sites outside of the Coso Range of influence. Based on 13 cation-ratio dates associated with curvilinear elements, the minimum range of 8050 B.C. to A.D. 1625 is proposed for the Great Basin Curvilinear Abstract Style. Five Great Basin Rectilinear Abstract elements were analyzed through cation-ratio dating and found to range roughly from 2800 B.C. to A.D. 1750. Unfortunately, only one Representational Style element had been dated at A.D. 1370, and a range was not established for this style. Whitley and Dorn (1987) concluded that their work shows the Great Basin Abstract Style to be older than previously thought and that the successive chronology of Curvilinear, Rectilinear, and Representational Styles is essentially correct with continuation and expression of all forms into the late prehistoric and historic times.

Direct radiocarbon dating of pictographs has been developed (Russ *et al.* 1992, 1993). The process has been successfully used to precisely date pictographs in Texas, Arizona, Utah, and Wyoming. Unfortunately, radiocarbon analysis of pictographs in Nevada has not yet been tried; however, it remains a promising avenue of research. As such, no chronometric age range exists for the Great Basin Painted and Puebloan Painted Styles. For that, we must depend upon relative age schemes previously presented until such work can be accomplished in Nevada and the Great Basin in general.

10.0 RESEARCH QUESTIONS ADDRESSED

A series of research questions were posed in the Implementation Plan (White 1998b). These questions helped direct data collection during fieldwork and facilitated eventual data analysis. Based on the collected and analyzed data, previously discussed, the research questions are restated here and then addressed.

10.1 HUMAN-CAUSED IMPACTS

Question 1. *What type of modern human-caused impacts are present, if any, at each of the four study sites?*

All of the study sites have readily detectable indications of modern human-caused impacts, each to a greater or lesser degree in comparison. Civet Cat Canyon exhibits military impacts as a result of short-term use in WWII and later. It was within an impact zone for deactivated target 71-4, located about 100 meters to the northwest (Myhrer 1999c). In addition, several recent cans are scattered throughout the site. To a far lesser degree, Airfield Canyon exhibits modern refuse in the form of a few military ordnance fragments and a couple of beverage cans. Types of impacts to the three White River Narrows loci include defacing of petroglyph/pictograph panels by spray-painted graffiti, name and date pecking/scratching, chalking of design elements, trash, and campfire rings, a modern highway passing within short distance of all three loci. Although few impacts were noted specifically at the Red Pigment Canyon site, the larger archaeological complex in the vicinity has been impacted from unauthorized surface and subsurface artifact collection, recreational sport hunting, modern refuse, and campsites complete with collector's piles and fire rings. Of the four study sites, the White River Narrows and Civet Cat Canyon sites have suffered the most from modern or near-modern impacts, while Airfield and Red Pigment Canyon are the most intact and least damaged.

Question 2. *What are the differences between the types of modern human-caused impacts, and are they a reflection of the different land management strategies?*

The differences in site impacts are a direct reflection of the two land management strategies.

As might be expected, the two NAFR sites have been impacted from military activities. Of the four study sites, however, Airfield Canyon is the least disturbed and most intact as far as the presence of archaeological remains, evidence of NAFB's restricted public access rules for the NAFR. The two sites on public lands in the overflight zone suffer from a different set of modern human-caused impacts such as painted graffiti, unauthorized artifact collection, adjacent recreational campsites, and increased trash. This amplified quantity and degrading quality of impacts to cultural resource sites on public lands is seen as an unfortunate consequence of open, unrestricted access policies. The construction of a major state road through the White River Narrows contributes to the unfortunate degradation of that site and a management problem for BLM.

Question 3. *If modern human-caused impacts are identified, do the impacts affect the ability of the site to convey its significance?*

Despite the varying degree and kinds of modern human-caused impacts noted at all of the study sites, it is felt by the authors that the identified impacts do not greatly depreciate the ability of each site to convey significance at the cultural and research level. Although the primary focus of the study sites is prehistoric petroglyph and/or pictograph research, it can be argued that in the instances of the two NAFR sites, military impacts and activity are an integral part of site formation and a cultural research theme in its own right (not to be construed as a blessing for continued impacts, however). Likewise, it is unfortunate that some people find it necessary to leave their mark on prehistoric petroglyph/pictograph panels, an act not condoned here and punishable by law, but such activity is nevertheless part of individual site formation and no doubt subject to future investigations; even the process of rock art recording has its own impacts.

Outside of the research domain, rock art has cultural significance for all Americans. Its popularity as an interest subject is attested to by magazine articles and television programs. To the Native Americans who see themselves as "the stewards of all resources," these sites remain significant (Arnold *et al.* 1999), and "It is doubtful that any damage would decrease the value of the site in their view" (Myhrer 1999a).

The loss of artifacts, particularly diagnostic types, through unauthorized activity does diminish the ability of researchers to collect important data that would assist in establishing the relative age and use of a particular site. This has apparently occurred at both the Red Pigment

Canyon and White River Narrows, Locus II, where previously noted projectile points and ceramics no longer exist. Despite the loss of these types of chronologically sensitive data, if the research focus of any study is the potential that petroglyphs/pictographs have for revealing age determinations, then the unfortunate loss of diagnostic artifacts does not compromise a site's ability to convey significance from the point of future archaeological research. It just makes it harder to have reliable age comparisons; in such cases, more is better.

10.2 SONIC BOOM EFFECTS

> **Question 4**. *Can it be determined by close inspection of cracks surrounding petroglyph and pictograph panels if the cracks are associated with natural weathering processes or as the result of aircraft noise and/or sonic boom impacts?*

Essentially, this research question was addressed in the discussion presented above. Despite obvious human-caused impacts of various types and degrees noted at all study sites, the natural geomorphic processes are remarkably similar in all aspects. Observation of physical properties at the study sites failed to yield a single instance of rock panel degradation that is inconsistent with natural weathering processes. There is no indication that sonic booms have contributed detrimentally to the preservation of petroglyphs and/or pictographs on reasonably solid rock faces. Where, however, petroglyphs and/or pictographs are depicted on rock faces that have been seriously weakened by chemical weathering, sonic boom shock waves may enhance or accelerate natural processes and the exfoliation of loose material from the rock surface.

10.3 CHRONOMETRIC AGE DETERMINATIONS

A series of six research questions was initially proposed to guide the collection and analysis of samples to obtain chronometric dates from petroglyphs and pictographs (White 1998b). Subsequent consultations among the Nevada SHPO, NAFB, and the Native American consultants determined additional research should be conducted prior to initiating the use of chronometric techniques on petroglyphs and/or pictographs within the NAFR. As part of this document, various

chronometric age determination techniques are briefly discussed below as are additional research questions. Although the chronometric objective was canceled and the questions left generally unaddressed, the initial research questions focused on cation-ratio and plasma-chemical extraction techniques are restated here in the hopes that other researchers may apply them to their own petroglyph/pictograph quandaries, a problem domain ripe for study in Nevada.

> **Question 5**. *Either chronometrically or in relative comparison using the cation-ratio technique, will the age determination derived from petroglyph samples correspond or differ with cation-ratio time frames established for other cation-ratio petroglyph sites in the southwestern Great Basin?*
>
> **Question 6**. *Will relative or chronometric cation-ratio derived dates differ or be similar in a comparison between the four study sites?*
>
> **Question 7**. *In cross-check with chronometric age estimates obtained from pictographs, will the cation-ratio sample dates be of contemporaneous age?*
>
> **Question 8**. *Based on archaeological inference, will pictographic age estimates derived from the White River Narrows correspond with suspected Fremont and Numic occupation of the area?*
>
> **Question 9**. *Will age estimates obtained from pictographs located in Red Pigment Canyon correspond with the Archaic, possible Puebloan/Fremont, or later Numic occupation of the area?*
>
> **Question 10**. *If diagnostic artifacts (i.e., obsidian, charcoal) are present at any of the study sites, will age estimates extracted from these artifacts support or detract from dates acquired from the petroglyphs and/or pictographs?*

Whether relative or absolute, chronology is an important problem domain in archaeological research. Even though no samples were collected from petroglyphs and pictographs or taken from collected obsidian artifacts for the purpose of chronometric age determinations as initially designed, the collection of three charcoal samples for C-14 analysis did result in direct dates. Additionally, chronological data presented above based on various archaeological concerns can help place the study sites in a temporal context, in partial answer to the chronological questions presented above.

If the recovered collection of dates is utilized collectively, Airfield Canyon appears to be the

oldest of the study sites. Based on the projectile point chronology for two collected point fragments, a wide time range of 10,000 B.C. to 500 B.C. is implied. The single radiocarbon date derived from a charcoal sample extends that range to A.D. 100 for site use. Primarily composed of curvilinear and, to a lesser degree, rectilinear abstract petroglyph elements representative of the Great Basin Abstract Style, a minimum range of 8050 B.C. to A.D. 1750 is suggested by using Whitley and Dorn's (1987) data for the extreme southwestern Great Basin. Thought to be associated with the Numic spread (Bettinger and Baumhoff 1982), the scratched elements as well as the few pictographs (both A.D. 1000 to ??) at this site remain problematic and do not necessarily mean site use by Shoshonean groups. Lacking direct evidence of later cultural group association, this site is clearly Western Archaic, and a conservative time range for the use of this site and the creation of the petroglyphs at this location is 6000 B.C. to A.D. 100.

The Civet Cat Canyon site appears to be the second oldest. If the projectile point chronology for the two collected point types is used, a temporal range of 6500 B.C. to A.D. 1000 is suggested. Petroglyphs at this site are dominated by curvilinear and, to a lesser extent, rectilinear abstract elements true to the Great Basin Abstract Style ranging in age from 8050 B.C. to A.D. 1750 using Whitley and Dorn's (1987) scheme. Again, the scratched elements (A.D. 1000 to ??) are problematical, and there is no evidence to suggest the site was used by later cultural groups. This site appears to be typical of the Western Archaic, and a conservative temporal range for this site is 4000 B.C. to A.D. 1.

Red Pigment Canyon is the next oldest. Previously observed, an Eastgate Style projectile point places the site range at A.D. 1 to A.D. 1500. Extending the temporal range, the Pahranagat Representational Style is suggested at 300 B.C. to A.D. 500, and a single Moapa Gray Ware sherd ranges from A.D. 950 to A.D. 1150. Additionally, the presence of an archer implies a post-A.D. 500 date, and the previously noted cut nail fragment and Numic Brown wares in the surrounding project area suggest Numic occupation into the historic period. Founded on this data, a conservative temporal context for the use of this site and the creation of the petroglyph is from 300 B.C. to A.D. 1860+, late Archaic to historic times.

Finally, the petroglyphs and pictographs of the White River Narrows appear to be a mixed bag of dates. A single identifiable atlatl petroglyph at Locus III implies a pre-A.D. 500 date, while

the A.D. 1400-1515 radiocarbon date from a burnt bush does not contribute to the chronology of the prehistoric petroglyphs. The pictographs at Locus II, extremely faded, remain problematical in that there are no temporal indicators; the single radiocarbon date at the base of the cliff appears to have been contaminated with bomb carbon and reflects a recent age. Many elements depicted at the complex petroglyph panels at Locus I are characteristic of the Fremont. Although Schaasfma (1986) suggests an A.D. 750 to A.D. 1300 range for Fremont petroglyphs, a more conservative date range for Locus I, and the three loci in general, can be expressed as A.D. 1 to A.D. 1300+.

10.4 ANCILLARY RESEARCH QUESTIONS

Although not called for in the project's scope of work, an opportunity existed to explore other issues pertinent to current petroglyph/pictograph studies that could be addressed by using data collected for the project. As such, two questions were asked.

> **Question 11**: *Aside from geometric abstract patterns, entoptic designs commonly identified at Great Basin rock art sites, are specific symbols thought to represent metaphoric themes depicted at any of the four study sites?*

As background, over the past decade Whitley (1992, 1994, 1997, 1998) has been actively promoting an interpretive model that replaces a long-held assumption that petroglyphs and pictographs functioned as sympathetic "hunting magic" in a socioeconomic context (Heizer and Baumhouff 1962). Although unproven, the assertions are interesting and popular with a few unquestioning scholars. Briefly, Whitley's (1998:148) premise consists of the following assumptions: (1) petroglyphs/pictographs were made solely by shamans or shaman initiates; (2) petroglyph/pictograph sites are shamans' vision quest locales; (3) petroglyphs/pictographs depict hallucinatory images perceived by the shaman during an altered state of consciousness; (4) petroglyphs/pictographs are invested with supernatural potency; and (5) the petroglyphs/ pictographs are mnemonic devices to help the shamans replenish their supernatural powers. Whitley's assertions are based on his review of Numic ethnographic literature in combination with a neuropsychological model of altered states of consciousness advanced by Lewis-Williams and Dowson (1988). Under the neuropsychological model, geometric abstract design elements are

thought to be entoptic, "within the eye," patterns, representational elements are construed as culturally meaningful images, and complex representational elements incorporating abstract designs are the last stage in three progressive steps of mental imagery occurring during an altered state (Lewis-Williams and Dowson 1988). Whitley's model helps explain who (shamans) created the petroglyphs and pictographs, the origin of the designs as the result of trance or altered states, and goes as far as attempting determination of which metaphor is an important concept.

During an altered state of consciousness, the body often experiences certain somatic feelings that give the impression that one is physically participating in the visionary experience (Whitley 1998). Whitley argues that symbolic metaphors were used to explain otherwise indescribable experiences resulting from hallucinations. Discussed metaphoric themes include death, flight, underwater/drowning, sexual arousal/activity, and aggression (Whitley 1998:154-155). Petroglyph/ pictograph elements that might be used as metaphoric expression for flight include avian images, spirals, and concentric circles. Aquatic elements might express drowning or the ability to go underwater. Vulvaforms or phallic anthropomorphs could represent metaphors for sexual activity, while death is metaphorically symbolized by hunting scenes and/or dying animals, and aggression by battle scenes.

In response to the posed question, some petroglyph elements were documented that might depict symbolic metaphors, as suggested by Whitley (1998). An example for flight, a dynamic combined petroglyph and red pictographic concentric circle is found at Red Pigment Canyon. Concentric circles also occur at Airfield Canyon (n=4) and the White River Narrows (n=6), where spirals, two each, also occur (Appendix A). None of the sites contained any recognizable avian images or elongated, stretched as if flying, anthropomorphs.

Petroglyph elements thought to represent aggression were not present at Civet Cat, Airfield Canyon, or White River Narrows study sites. An archer, however, is present at Red Pigment Canyon. Holding a bow and arrow, the archer appears to be aiming/shooting at another smaller anthropomorph standing to its left as are two other smaller, more distant anthropomorphs. Although not representative of battle or shooting scenes, weapon/hunting tools depicted as atlatls are present at Civet Cat, White River Narrows Locus III, and Red Pigment Canyon. Atlatls portrayed by themselves may have a different connotation than aggression, perhaps hunting or fertility.

Of all the study sites, sexual activity, or perhaps fertility, was expressed graphically most often at Red Pigment Canyon and, particularly, White River Narrows, Locus I. Nine vulvaforms were documented at Red Pigment Canyon, 15 at White River Narrows, one at Airfield Canyon, and none at Civet Cat. In addition to the vulvaforms at the White River Narrows locale, five female-like anthropomorphs are pecked into the canyon wall. Two of the female-gendered anthropomorphs are similar in some characteristics to Pahranagat Man of the Pahranagat Valley. If determined to be female variants of this unique design element, they are truly curious, as they are the only known representatives. Also depicted at the White River Narrows are two mountain sheep, one in front of the other, sinuous lines radiating from the rump of the lead animal obviously indicating pheromone activity, with the tailing animal testing the scent. Phallic anthropomorphs are not present at any of the sites as might be expected as a graphic metaphor for shamanic sexual demeanor.

Death as a metaphor, symbolically depicted as hunting, killed or dying animals, particularly sheep, was not documented at any of the study sites. Whitley (1998) also argues that shot or dying mountain sheep represent weather control, the petroglyph sites of the Coso Range being thought to be the premier location for weather control because of the depiction of many shot sheep visible there. Apparently, the four study sites were not considered for their ability to control the weather, nor did the petroglyph creators consider death an important enough metaphor to express in graphic form.

Along with death, drowning was not expressed at any of the study sites, or at least, it was not recognized by the recording crew as such, even though plunge pools and tinajas were documented at two sites. Certainly rakes, wavy or meandering lines, and tailed circles, thought by some researchers to imply falling rain, water courses, and water tanks, respectively, are found at all sites. This, however, would be expected, as water is such a critical factor to survival in the Great Basin and is probably not metaphoric; rather, it represents practical concerns on the part of the person creating the design.

Despite the few possible metaphoric representations discussed above, such symbolism does not appear to be a significant consideration at the four study sites. Although inconclusive, and keeping in mind that the project's research parameters were not designed specifically for testing the altered state/shamanic model, problems do seem to exist with the proposed model in relation to the study sites. For example, it would be expected that petroglyph elements representing all three altered

state/trance stages would be present at all petroglyph sites (i.e., geometric abstract; culturally relevant representational; complex representational elements with interior geometric designs). This is not the case, particularly with complex representational characters. The one exception might be the Pahranagat patterned body anthropomorph such as documented in Red Pigment Canyon. Are we to believe then that shamans at the study sites progressed, in some cases, only to the second stage of altered state experiences or were not mentally sophisticated enough to express the third-stage imagery graphically? Are the Civet Cat and Airfield Canyon petroglyphs primarily an expression of first-stage trance imagery because of such a large percentage of suspected entoptic (abstract) designs and so few representational and no complex representational elements? Or are the petroglyphs evident at the four study sites a product of evolutional sophistication in the expression of graphic symbols as hinted at by Heizer and Baumhoff (1962)? Are the Pahranagat patterned body anthropomorphs, similar in many respects to Coso-style shaman figures, images obtained in the third stage of altered states or the product of some other cultural phenomena making them unique to the Pahranagat Valley? If we are to accept altered state/shamanic model, why aren't second and third-stage complex representational figures found at all petroglyph sites?

These are questions that need to be asked and debated about petroglyphs and pictographs in general. The "one size fits all" model proposed by Whitley and Lewis-Williams and Dowson does not work particularly well at the study sites and may be applicable only to Coso-style sites, studied by Whitley (1998), and not necessarily the Great Basin. The shamanic trance model has replaced the earlier hunting magic paradigm as a scientific approach to petroglyph/pictograph meaning. But as Woody (1997:134) states, "both [models] suffer from the same weakness, however, assuming that all rock art served only a single purpose, or had a single meaning," a position held here as well.

> **Question 12.** *Based on elemental design tallies for Coso, Little Lake, and 71 Nevada rock art sites (Whitley 1998:114-115, 135), how do the four study sites individually and/or collectively compare to the design categories?*

In order to address this comparison question, it is first necessary to present additional information relevant to the question. Whitley (1998), further promoting his own agenda in a rational argument, has conveniently compiled element tallies for the Coso, Little Lake, and 71 Nevada sites based on the work compiled by Heizer and Baumhoff (1962), Grant *et al.* (1968), and himself. Since

Whitley's tallies represent only geometric abstract and representational petroglyph elements to the exclusion of all other considerations that may or may not have been present in the data base, it is necessary to manipulate the four study site tallies correspondingly. This was done by simply dropping the number of elements in the "All Others" category of Table 8 and letting the combined counts for abstract and representational petroglyph elements equal site totals without significantly affecting previously presented data. The adjusted study site count/percentages and Whitley's figures are presented in Table 10 and, in graph form, in Chart 3.

Similarities and differences are apparent based on Table 10 and Chart 3. It was initially expected that the tallies for the four study sites would be consistent with the 71 Nevada sites and unlike the Coso sites, which contain an exceptionally high percentage of representational elements (White 1998b). While it can be seen that the study sites are generally dissimilar to the Coso complex, only the White River Narrows nearly matches the 71 Nevada and Little Lake sites in both abstract and representational element percentages. This is interesting because the petroglyphs within the White River Narrows are thought to be of Fremont origin or Puebloan influence, which does not penetrate Nevada that much farther east. Civet Cat and Airfield Canyon, both alike in general petroglyph characterization, appear higher in abstract and correspondingly lower in representational elements than the 71 Nevada/Little Lake sites. Red Pigment Canyon remains unique in its total assemblage, falling between the Coso and 71 Nevada/Little Lake site figures.

On second glance, problems with some of the presented information do exist; consequently, it should be used with comparative caution. While the four study site element tallies express individual site characterizations, tallies for Whitley's Coso and 71 Nevada sites actualize cumulative totals for numerous individual sites. Such totals may or may not reflect the true petroglyph element characterization of individual sites. For example, the Little Lake site is in the region of Coso influence, containing Coso-style petroglyphs, yet it is more similar to the 71 Nevada sites in counts than to the Coso complex. This lumping of sites for Whitley's (1998) comparative purposes may explain why the White River Narrows element characterization is similar to the 71 Nevada sites despite the presence of obvious Fremont-like anthropomorphs and other designs. Likewise, the amalgamation may also account for why Civet Cat and Airfield Canyon are dissimilar to the 71 Nevada sites even though they are considered to be atypical of Western Archaic petroglyph

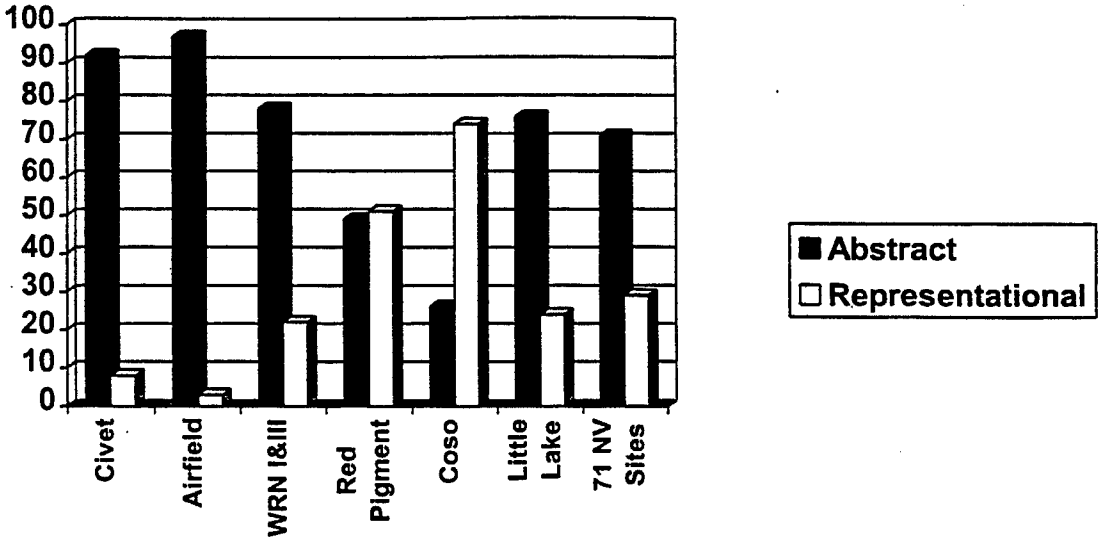
sites for that region of Nevada.

Table 10. Comparison of Abstract and Representational Element Count/Percentage by Site.

Sites	Geometric Abstract		Representational	
Number/Percentage	n=	%	n=	%
Civet Cat Canyon	77	92	7	8
Airfield Canyon	102	97	3	3
White River Narrows I&III	224	78	64	22
Red Pigment Canyon	53	49	56	51
Coso sites	3,673	26	10,352	74
Little Lake site	310	76	98	24
71 Nevada sites	3,382	71	1,397	29

n= number

Chart 3. Comparison of Abstract and Representational Petroglyph Element Percentages by Site.



11.0 NATIONAL REGISTER ELIGIBILITY

Evaluation of cultural resource significance and the determination of eligibility for inclusion in the National Register are based on or measured against any or all of four broad criteria as defined in Federal Regulation 36 Code of Federal Regulations (CFR) 60. The criteria embody sites:

(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinctions; or

(d) That have yielded, or may be likely to yield, information important in prehistory or history.

In addition to the above criteria, an identified cultural resource must possess integrity of location, design, setting, materials, workmanship, feeling, and association. Further, cultural resource properties must be evaluated within meaningful frameworks of historic contexts defined by theme, place, and time. All four study sites are associated with a prehistoric context, petroglyphs and/or pictographs the dominant theme, and generally southern Nevada for a spatial reference frame. Based on relative age determinations, the prehistoric time frame for the study sites ranges from the early Archaic to historic times. Additionally, one site, Civet Cat Canyon, is associated with a historic context of mining, ranching, and the military. Below, the four study sites are evaluated for National Register qualities. For quick reference, eligibilities are presented in Table 11.

Before discussing individual site justifications for National Register eligibility, it is first necessary to comment on traditional cultural properties in relation to the National Register eligibility evaluations for this project. "Traditional" refers to those "beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through

Table 11. National Register Eligibility Status

Site Number	Site Type	National Register Eligibility
26NY369	Petroglyphs and Historic Ranching and Military	Criteria A & D
26NY2252	Petroglyph/Pictographs, Rockshelter, & Lithic Scatter	Criterion A & D
26LN210, Loci I, II, III	Petroglyphs and Pictographs	Criterion A & D, National Register-Listed
26LN4232	Petroglyphs/Pictographs and Rockshelter	Criterion A & D

practice" and that cultural significance as it applies to a historic property is "derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" (U.S Department of the Interior 1992:1). As such, a traditional cultural property is a property that is "eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that a) are rooted in that community's history, and b) are important in maintaining the continuing cultural identity of the community" (U.S Department of the Interior 1992:1). Although it may be the beliefs and practices of the community that impart cultural significance to a particular property, the property itself must be a tangible rather than an intangible resource and subject to the evaluation criteria presented above.

While. it has not been determined that these four sites are indeed traditional cultural properties to a specific community, they nonetheless have religious and cultural significance to the Native Americans in general. In a review of this document, it was stated "Indian people believe that they are the stewards of all resources including petroglyphs and pictographs that were left by our ancestors or other supernatural beings. As such, these precious resources ... are a critical link to our past and needed to preserve our future. ...Indian people interpret these areas in a holistic manner which includes all physical and spiritual resources. ...[I]t is important to understand that Indian

people still maintain their same cultural values" in relation to petroglyph and pictograph sites (Arnold *et al.* 1999).

11.1 CIVET CAT CANYON (26NY369)

Site recordings conducted in the early 1960s are sparsely noted, confusing, and are inadequately described at Civet Cat Canyon. At the time no National Register recommendations were made. Later, in a 1979 recording effort, it was recommended that the "Historic component should be nominated to the National Register as part of a thematic district dealing with early 20th century mining boom" and that the "prehistoric component is also significant and a potential National Register property" (archived site form). Similarly, Bergin *et al.* (1979) recommended that the site had "potential" National Register status. During a 1995 cultural resource inventory, York *et al.* (1996) recommended that the site is National Register-eligible under Criteria (c) and (d), stating that the "prehistoric component is an excellent example of Western Archaic rock art and can provide valuable data regarding the elements and distribution of the style" and that "Additional material (obsidian) can help provide temporal context for the petroglyphs" (archived site form). York *et al.* (1996) adds that the "historic component contains relevant information concerning the exploitation of the region by ranchers and miners" (archived site form). Evidence at the site also indicates the possibility that structures constructed in 1940 are of WWII vintage and associated with military activity of some unknown nature.

Although this site had short-term use within a target zone and some of the petroglyph panels have been affected by ordnance impacts, the damage done has minimally detracted from the overall site integrity and has not adversely affected the defining physical features of the site. It could be argued, in fact, that the use of the site during WWII and resulting damage as a target contributes to this dynamic site and is a thematic context (military) of its own.

Under Criterion (a), the site appears to be significant for Native American religious and cultural values (Arnold *et al.* 1999). It is unlikely that this site is associated with the lives of persons significant in our collective past; this cannot be concluded without further detailed archival research under a mining, ranching, or military theme. The built ranching and military features at this site do

not embody distinctive characteristics of a unique type and method of construction under Criterion (c). Although it can be argued by some that the petroglyphs depicted at this site possess "high artistic values" under Criterion (c), it is the perspective of this document that petroglyphs/pictographs do not articulate particular concepts of design that express an *aesthetic* ideal of *art* in the Western meaning of the words; the application of this aspect of Criterion (c) forces a certain amount of Western bias into our interpretations of the subject matter that is not founded at this stage of problem domain research. The site was thoroughly recorded, and test probes were unable to define evidence of stratigraphy or buried cultural deposits, implying that the site would no longer be eligible under Criterion (d). However, the petroglyphs themselves may at some future date be the subject of chronometric age determination techniques. As such, the prehistoric petroglyph component of this site may likely yield information important to our understanding of prehistory. As a result of this study, it is recommended that this site is eligible for nomination to the National Register under Criteria (a) and (d).

11.2 AIRFIELD CANYON (26NY2252)

The Airfield Canyon site form was updated in 1996 from an initial recording in 1979. During the later recording, this petroglyph/pictograph site was recommended as being potentially eligible for nomination to the National Register (archived site form; Crownover 1981), and in 1991, it was determined to be National Register-eligible under Criteria (c) and (d) (York *et al.* 1996). As justification, "the site is an excellent example of Western Archaic rock art and can provide valuable data regarding the elements and distribution of this style" and "abundant obsidian at the site can help provide some temporal context" (archived site form). Because of its location within a military reservation and its intactness, site integrity is not an issue. This site has significant Native American religious and cultural values under Criterion (a). It is unlikely that this site has contributed toward the life of a significant person, Criterion (b). As argued above for unassessable artistic values, this site is not considered National Register-eligible under Criterion (c). Aside from Criterion (a), this site is also eligible for nomination to the National Register under Criterion (d) for its potential to yield significant data important to our understanding of prehistory. The petroglyphs/pictographs

have the potential to yield chronometric age determinations; the test probes have shown that subsurface cultural deposits are present, and additional obsidian artifacts exist that will allow the establishment of a temporal context for this well-preserved site.

11.3 WHITE RIVER NARROWS LOCI I, II, & III (26LN210)

Previously recorded as one huge site extending the length of the Narrows, all of the separate archaeological loci have been lumped under the site designation of 26LN210 and were identified but never properly recorded in 1967 (archived site form). Since that time, BLM has issued separate site identification numbers that have been applied in reference to the known archaeological loci. Although the study loci have been variously impacted by public access due to their location in association with a state road, the degree of impacts has not adversely affected the integrity of each locus. As was the custom at the time, the 1967 site form does not mention or recommend whether or not the site is eligible for nomination in the National Register. In 1978, however, the sites associated with the White River Narrows were collectively placed on the National Register as a district. In simple brevity, the nomination form's Statement of Significance states that the Narrows "display the best preserved and most extensive petroglyph panels to be found in Eastern Nevada," and that it is characterized by a "unique series of petroglyphs and other aboriginal features representing prehistoric American culture in a very scenic and wild setting of sheer cliff faces and outback solitude." As such, the district was placed on the National Register under Criterion (d). Despite the lack of surface and subsurface cultural material at the study sites (Locus II being the potential exception because of subsurface deposition), the petroglyph/ pictograph panels have the potential of addressing chronometric concerns. Because of the current National Register status of the White River Narrows, it is not necessary to justify its inclusion under other evaluation criteria. Despite this, the individual loci with the White River Narrows are probably eligible under Criterion (a) for their Native American cultural and religious significance.

11.4 RED PIGMENT CANYON (26LN4232)

Red Pigment Canyon was first recorded in 1997 as part of a volunteer recording effort under agreement with BLM. This site is part of a larger complex of archaeological sites situated in a drainage basin within the Juniper/Pinyon zone. Despite use of the area for recreational purposes and ample evidence of artifact collection, site 26LN4232 possesses a high degree of site integrity. For National Register justification under Criterion (d), the 1997 archived site form states that the "site can contribute to petroglyph and pictograph studies ... contributing to chronometric studies which are lacking for this region," and "because of the apparently intact midden deposit associated with the rockshelter, research questions can be formulated to address subsistence, environmental adaptation, and local resource exploitation from the Archaic to early historic contact." The current study supports this initial National Register evaluation under Criterion (d), and the single test probe conducted by HRC suggests that buried cultural material is present, although any visible stratigraphy is lacking. Given the Native American position stated above, the site appears to be eligible under Criterion (a) for its cultural and religious significance. It is unlikely, however, that the site is additionally eligible under Criterion (b), significant persons, or Criterion (c), design, construction, work of a master, or high artistic value, since no evidence was produced to suggest applicability under these evaluation criteria.

12.0 ESTABLISHING CHRONOMETRIC AGE DETERMINATIONS ON THE NAFR

This section offers a brief review of known chronometric techniques thought to be applicable to petroglyph/pictograph dating as well as style as a cultural and temporal indicator. It further offers a refined chronology for the various styles thought to be present within the boundaries of the NAFR and adjacent overflight, BLM lands. Research questions are offered to test the chronology and recommendations for the implementation of data collection.

12.1 CHRONOMETRIC AGE DETERMINATION TECHNIQUES

How old is it? Humankind has asked this question ever since the concept of antiquities was conceived, a mental function of curiosity. Thus, chronology has been a major precept of archaeology as well as other scientific disciplines. In relation to petroglyph/pictograph research, Schaafsma (1985:241-242) proposes that: "If rock art imagery is to be successfully integrated with its cultural matrix, a necessary step for its use as an archaeological resource, there has to be some means of locating it in time." In the study of archaeology, chronology is established by means of relative or absolute measures or a combination of both avenues to either support or call into question the results.

Numerous research techniques will yield relative dates. Relative dating approaches include comparative differences in weathering or accumulation of patination (Dorn 1990), superpositioning of elements over others (Grant *et al.* 1968; Woody 1997), and the vertical placement of designs on cliff faces in relation to subsequent accumulation or erosion of the ground surface (Schaafsma 1985). Additional relative methods entail temporally sensitive subject matter such as human figures mounted on horses, bow/arrow verses atlatl/dart depictions, or projectile point styles (Thomas and Thomas 1972) and a geographic correspondence with a particular style associated with a cultural group of known age (Turner 1963).

Attempts have been made to secure absolute, direct, or chronometric age determinations from petroglyphs and pictographs over the last two decades, absolute representing age estimates with a margin of error (±) often represented in years before the present ([B.P.] A.D. 1950). In a

development stage, some chronometric techniques used in analyzing petroglyph and/or pictograph samples have been successful with generally accepted results while others remain controversial, subject to ongoing debate. Chronometric dating methods are usually expensive, often require removal of minute samples, and the resulting dates should be viewed as tentative— remembering that age estimates are only as accurate and precise as current methods permit (Dorn 1998). Some of the chronometric techniques currently available are briefly discussed below and are synthesized from the Rock Art Dating Roundtable (Reclamation 1998) or other works as referenced.

12.1.1 Plasma-Chemical Extraction and AMS Radiocarbon Dating

This age determination technique assumes that organic material is present in inorganic pigments as a component of the paint's binding agent or as a pigment itself used to create pictographs (Russ *et al.* 1990, 1992, 1993; Hyman and Rowe 1997). The plasma-chemical process selectively removes organic carbon from pictograph samples utilizing a low temperature, low pressure oxygen plasma coupled with high vacuum techniques without contamination from inorganic material within the rock substance. Extraction is then followed by standard accelerator mass spectrometric (AMS) analysis of the resulting product (Russ *et al.* 1992, 1993). In order to obtain a 70 μg (microgram) sample of carbon necessary for a reliable AMS radiocarbon date, it is necessary to remove a 2 cm diameter specimen for inorganic pigments and even smaller amounts for organic charcoal pictographs. To minimize visual impacts, pieces are removed from multiple points in order to collect the desired material. When possible, only loosely attached rock flakes are used and nearby unpainted rock surfaces are sampled to evaluate the background (Hyman and Rowe 1998). The technique has been successfully used in pictograph age determinations from various sites in Texas (Russ *et al.* 1990), Wyoming (Francis *et al.* 1993), Montana (Chaffee *et al.* 1994a), Utah (Chaffee *et al.* 1994b), and California (Armitage *et al.* 1997). A similar process has been developed and successfully used in the dating of pictographs in Australia, Argentina, and South Africa (Watchman 1998).

12.1.2 Cation-ratio Dating

Rocks chosen for the depiction of petroglyphs in the arid or semi-arid West are covered with a ubiquitous dark layer of natural varnish in varying degrees of patination and accumulated thickness. Cation-ratio dating is based on the concept that particular cations, sodium, potassium, calcium, phosphorous, and magnesium, are more mobile and more easily leached than titanium (Dorn and Whitley 1983, 1984). All of these cations are found in desert varnish. A second premise of this experimental process is that a ratio of one or more mobile cations in relation to titanium decreases with time and will vary regionally (Whitley and Dorn 1987). In order for chronometric dates to be established using this method, the process necessitates the definition of a regional calibration or cation-leaching curve against which petroglyph samples are analytically measured. The curve is constructed by obtaining numerous chronometric dates based on independent dating methodologies obtained from late-Pleistocene, Holocene, and man-made surfaces of known antiquity (Dorn 1989, 1998; Whitley and Dorn 1987). Validity of the cation-ratio dating technique has been verified by other independent researchers but remains controversial given differences in sampling and analytical methodologies, resulting in discordant data (Dorn 1994, 1998). The process requires the removal of minute rock samples from selected petroglyph elements.

12.1.3 Varnish Encapsulated Carbon and AMS Dating

Plant and micro-organic material can become trapped and encapsulated by accumulating layers of desert varnish (Dorn 1994; Watchman 1998; Dorn *et al.* 1993; Francis *et al.* 1993). This technique involves the removal of a varnish sample from a petroglyph element, approximately 1 cm in size (precision is determinate on sample size). The sample is then mounted and scanned through light and electron microscopy in an effort to isolate any organic component trapped at the interface between the varnish and subvarnish rock surface (Dorn *et al* 1993). Once isolated, the varnish sample is subjected to chemical pretreatments to eliminate potential contaminants and reduce the varnish to remedial organic compounds. These compounds are then analyzed by standard AMS methods providing a minimum age estimate for the sampled petroglyph. This method has been

applied with mixed results and is not without controversy and critics (see Dorn 1996; Dalton 1998; Beck *et al.* 1998). Watchman (1998), however, sees the technique as being viable and finds it essential that it be applied in collaboration with other chronometric approaches to verify its worth.

12.1.4 Luminescence Dating

Berger and Mahan (1998) caution that there is no luminescence approach currently available that would provide a direct age for rock art. However, luminescence dating is site-sensitive and applicable to any heated rock containing quartz or feldspar or to sediment grains deposited around or on petroglyphs/pictographs. Germane primarily to geological phenomena, archaeological associations can be tested and involves the low-temperature emission of light measured through release by a chemical or physiological mechanism. Two classes of events that are routinely detectable through this established process include the last heating event and last daylight exposure of feldspar and quartz grains. As an example of the latter routine, a mud-wasp nest attached over a petroglyph was tested using the single-grain approach and resulted in a limiting age event date. Unheated sediment deposits in contact with a rock surface in an appropriate stratigraphic context can also be used to provide a limiting age. For dating stratigraphically deposited sediments, either thermal luminescence or optically-stimulated luminescence can be employed. Usually non-destructive to petroglyphs/pictographs, and depending upon the selected approach, the required sample size can range from as little as a gram to a few hundred grams pertaining to stratigraphic soil horizons.

12.1.5 Cosmogenic Nuclide Dating

On a galactic scale, the Earth's surface is constantly being bombarded by cosmic radiation. As a result, rare isotopes are created at a known production rate. Thus, it is possible to calculate the exposure of a rock surface to cosmic radiation by determining the concentration of certain cosmogenic nuclides (Phillips and Gosse 1998). This method can provide a maximum age estimate for the duration of time that a rock surface has been pecked or painted as well as a minimum age for

sediments deposited in cave or rockshelter features. The process, however, cannot provide a direct date on the time that the image was made. In order for the technique to work, site suitability depends upon site geomorphology. An optimum environment for cosmogenic exposure includes a slow rate of rock surface erosion and high site elevations, and the rock surface must not have been buried by other rocks, deep snow, or sediments. Measurements can be made in less than favorable circumstances, but modeling may be required to calculate the age estimate, thus increasing probable uncertainty in dates. The minimum practical limit for dating is 1000 years while the maximum is open. A minimum sample size for this method is 100 grams.

12.1.6 Cosmogenic Plus Dating

While individual components of this technique exist and have been tried with reliable findings, they have not been combined in an attempt to date petroglyphs (Lytle 1998). This technique is a two-step process. First, x-ray absorption spectroscopy would be used to measure the concentration of specific elements found in desert varnish that are proportional to the thickness of the varnish. By comparing the results between undisturbed varnish and the repatination associated with a petroglyph, a relative age can be deduced. Absolute techniques (e.g., cosmogenic radio nuclides, optical luminescence, C-14 AMS depending on site variables) would then be applied to nearby rock surfaces or other materials that encompass the apparent age of the petroglyphs. This material would then be subjected to the x-ray analysis to measure the varnish thickness and the results compared against the first step to provide an absolute date for the petroglyphs (Pingitore and Lytle 1999). Because of the untried and proposal status of the technique, it is expensive but has promising potential.

12.2 PETROGLYPH/PICTOGRAPH STYLE AS CULTURAL/TEMPORAL INDICATORS

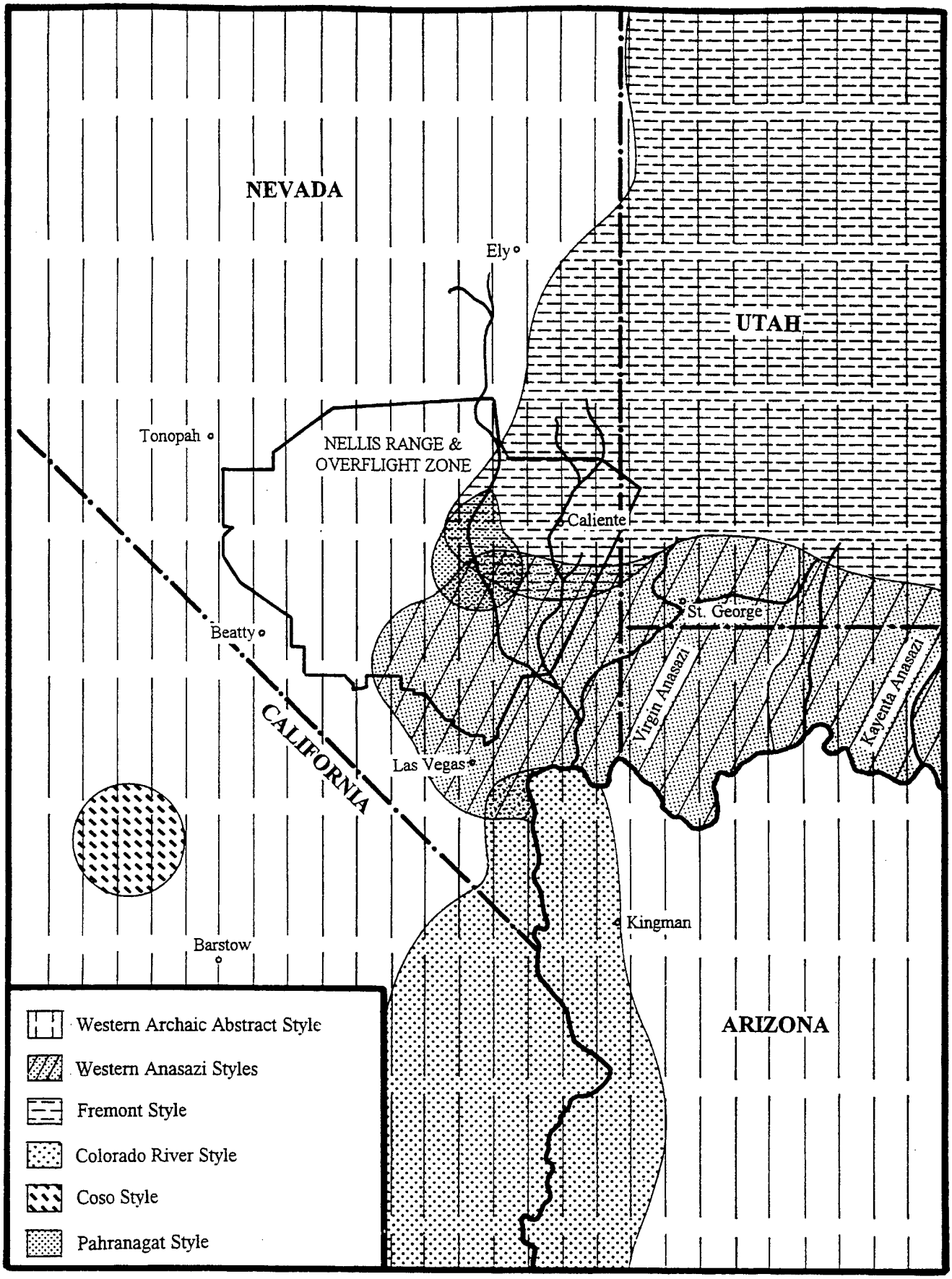
Sackett (1977) proposes that style is a manner in which something is done that is peculiar to a specific place and time. Further, style embodies a consistent set of preferences for certain forms and modes with a range of permissible variations determined by the society (Forge 1977). An

operating assumption of petroglyph/pictograph style is that only a limited number of formal possibilities of graphic expression are exploited by any given culture at any given time (Schaafsma 1985). A petroglyph/pictograph style is essentially a shared visual system comprised of a repertoire of element types and element complexes. They also include aesthetic modes signifying participation in a given ideographic system, interaction sphere, or panregional information exchange network (Schaafsma 1980). Thus, petroglyphs and pictographs have temporal and cultural contexts as well as geographic definition. The following styles are or have the potential of being represented on the NAFR and adjacent overflight lands.

12.2.1 Style as a Cultural Indicator

Castleton (1979), Grant *et al.* (1968), Schaafsma (1971, 1980), Turner (1963) and others have been quick to recognize that particular types of petroglyph/pictograph elements are associated with archaeological remains of distinct cultural traditions. Their investigations have determined that the spatial distribution of the element types that comprise the style most often correspond with archaeological sites associated with that culture and/or its interaction sphere. Map 13 illustrates general petroglyph/pictograph styles briefly discussed in this document and their approximate geographical distribution.

Steward (1929) and, later, Heizer and Baumhoff (1962) were the first to recognize an abstract style of great antiquity. Essentially comprised of curvilinear and rectilinear abstract elements with few representational characters, this style has been referred to as Great Basin Abstract Style within this region (Heizer and Baumhoff 1962). The style, however, appears to have a greater geographic spread (panregional) than previously thought and has been alluded to as the Western Archaic Abstract Style (Hedges 1982; Christensen *et al.* 1998), reflecting a "huge sea of sameness with pockets of distinction" (Woody 1999). Underlying other petroglyph/pictograph styles, this style is the product of a hunter and gatherer subsistence strategy that dominated the Great Basin cultural systems for thousands of years. This style has been identified at petroglyph/ pictograph sites on the NAFR (York *et al.* 1996; this document).



Map 13. Petroglyph/Pictograph Styles Identified in Portions of the Southern Great Basin Region.

Aside from the general abstract style so common throughout Nevada, stylistic variations have also been identified that are relevant to the NAFR and overflight area. They include the Virgin Anasazi, Fremont, Pahranagat Representational, and Colorado River Styles. A Native-Historic Style as well as elements associated with the Coso Style may be present in the study area. Some of the styles are less defined than others in both the type of elements and geographical distribution, and much work remains to be accomplished in this regard. New styles or localized variation in existing styles may be defined as petroglyph/pictograph research continues.

A Native-Historic Style, with no definitive geographical limits, can be found to co-occur with earlier prehistoric styles at sites located at perennial springs or temporary water catchments in the vicinity of travel corridors (Green 1987; Ferris 1999, personal communications). This style is dominated by equestrian-mounted anthropomorphs, anthropomorphs depicted in western wear (hats and boots), anthropomorphs depicted with rifle-like objects, and occasionally, horse-drawn wagons or women in dresses. Within the study area, such depictions can be attributed to the Western Shoshone and Southern Paiute who occupied the area during historic times and are probably expressions of contact with Euroamericans.

An anomaly, the Coso Style is unique unto itself that appears to have relatively tight geographical distribution (Grant *et al.* 1968). The core area for this style is the Coso Range of southern California. It is dominated by rectangular, full-body anthropomorphs with elaborate internal geometric designs, hooked atlatls, and bighorn sheep characterizations. What makes the sheep depictions atypical from standard Great Basin bighorn sheep is the head-on view of the sheep's head rather than the side profile. This style is associated with pre-Numic and later Numic groups. Although this style has a limited geographical distribution, a few isolated instances of sheep with head-on views have been encountered in the overflight zone by the principal author and others. Whether such depictions are an example of trait diffusion or an indicator of population movement (Numic spread) remains to be explored.

To the south of the study area, but nearly reaching into the Las Vegas Valley, the Colorado River Style has been preliminarily defined (Christensen *et al.* n.d.). It ranges from the eastern Mojave Desert to and along the Colorado River and is thought to have a Patayan/Yuman cultural affiliation. The Colorado River Style is characterized by an emphasis on symmetrical and elaborate

geometric patterns that include rectangular enclosed designs, enclosed bisecting lines such as crosses, I and T, pipettes similar to those found in the Hohokam region of Arizona, and patterned ovals or circles. Few in depiction, representational elements include digitated and lizard-like anthropomorphs, snakes, and bighorn sheep. The Las Vegas Valley appears to have been within the interaction sphere of the Patayan/Yuman cultural groups (Seymour 1997), and it is not unreasonable to expect that Colorado River Style petroglyphs/pictographs may occur in the southern portion of the NAFR.

Petroglyph and pictograph elements commonly associated with the Fremont core area of Utah have also been identified in eastern Nevada (Schaafsma 1971; McLane 1989; Fowler *et al.* 1973). Although it appears as though the Fremont continued to be influenced by the Western Archaic Abstract Style, they did develop a separate recognizable style that is most visible in anthropomorphic designs (Castleton 1979; Schaafsma 1971, 1980). The anthropomorphs of Fremont Representational Style are characterized by flat broad shoulders, tapered or trapezoidal torsos, thin arms and legs, trapezoid heads topped with headdresses of horns or feathers, and occasional internal body designs such as necklaces. Foot and hand prints, fletched lines, and extensive use of dots are also common with this style. Fremont-like petroglyphs, some with the addition of pigment, have been recorded in the overflight zone (this document).

Another apparent style anomaly with a relatively limited geographic disbursement is the Pahranagat Representational Style (Nissen 1982; Green 1985; Stoney 1991, 1992; Zancanella and Ferris 1990). Two primary element types characterize this style, initially identified by Heizer and Hester (1974), and include a figure referred to as the Pahranagat Man and Pahranagat patterned body anthropomorphs. Pahranagat Man is usually illustrated as a large, full bodied, solid pecked anthropomorph with peephole eyes, a spike at the top of its head, and digitated hands. The patterned body anthropomorphs are usually rectangular in shape, have no head, and have internal geometric designs. The cultural association of this style is unknown, but influence by either the Virgin Anasazi and/or Fremont cultural areas is probable. Additionally, the Western Archaic Abstract Style also continued to have an effect in this area. Numerous sites of this style have been recorded in the overflight zone, and Red Pigment Canyon is representative of this style.

Schaafsma's (1971) Virgin Kayenta Anasazi Style, later refined and renamed the Virgin

Representational Style (Schaafsma 1980), is based on sites identified in southwestern Utah and southeastern Nevada. Depicted in both petroglyphs and pictographs, the Virgin Representational Style is influenced by the Western Archaic Abstract Style with a noticeable reduction in design elements associated with the Anasazi core area further to the east. Despite this, representational elements constitute a large portion of the design elements including bighorn sheep, foot and hand prints, snakes, and anthropomorphs. Many of the anthropomorphs are depicted with the upper leg and arm fractions extending straight outward and then turning downward; such portrayals are an extension of a Kayentan connection to the east. Petroglyph/pictograph sites thought to be of Anasazi origin have been recorded on the NAFR (York *et al.* 1996).

Finally, Heizer and Baumhoff (1962) discuss the Great Basin Scratched and Great Basin Painted Styles. Little work has been done with these two separate styles beyond their initial recognition. Bettinger and Baumhoff (1982) propose that the scratched style is associated with Numic groups and their later occupation of the region. In studying pictograph elements on the Nevada Test Site, Monteleone (1993, 1994) found that the pigment figures, comprised of abstract and hand prints, were associated with protohistoric and historic archaeological remains of Shoshonian occupation. It has been argued, however, that the painted style is an expression of the Great Basin Abstract Style and should not be assigned its own style based on technique of presentation (McKee and Thomas 1973). Both scratching and painting have been recorded at sites on the NAFR (York *et al.* 1996; this document) as well as co-occurring with other general styles throughout Nevada. Problematic, much work remains to be done to further define and record spatial distribution of these styles or, in the case of the painted style, eliminate it as a separate class.

12.2.2 Style as a Temporal Indicator

Various researchers have used conventional archaeological methods to assign relative dates for particular petroglyph and pictograph styles. More recently, chronometric techniques have been applied to a limited number of petroglyphs and pictographs to ascertain more firm dates for sampled element creation. Both relative and chronometric age determinations have resulted in divergent chronologies. Steward (1929) perceived a relative progression of abstract elements followed by

representational characters. In their classic 1962 treatise, Heizer and Baumhoff applied relative dates to the styles they determined applicable to Nevada and eastern California. Their analysis resulted in the following chronology for the defined styles of this early study (Heizer and Baumhoff 1962:233-234):

> Pit and Groove - 5000 B.C. to 3000 B.C.;
> Great Basin Curvilinear Abstract - 1000 B.C. to A.D. 1500;
> Great Basin Rectilinear Abstract - A.D. 1 to A.D. 1500;
> Great Basin Representational - A.D. 1 to A.D. 1500;
> Great Basin Scratched - A.D. 1000 to ??;
> Great Basin Painted - A.D. 1000 to ??; and
> Puebloan Painted - A.D. 500 to A.D. 1150.

Working with more localized styles, other researchers have proposed similar relative dates for their study styles. For example, Grant *et al.* (1968) suggest that the Coso Representational Style, divided into three phases based on the absence or presence of the bow and arrow or atlatl, dates from 1000 B.C. to A.D. 1000. Heizer and Hester (1974) propose dates of 300 B.C. to A.D. 500 for the Pahranagat Style because of the depiction of atlatl elements in association with the Pahranagat figures. Based on cultural area associations, Schaafsma (1986) suggests an A.D. 750 to A.D. 1300 date range for the Fremont Style while an A.D. 700 to A.D. 1150 range for the Western Anasazi (Virgin-Kayenta Anasazi). Lyneis *et al.* (1989), however, places the Virgin Anasazi of the Moapa Valley at 300 B.C. to A.D. 1150. Without a proposed chronology for the Colorado River Style, a relative age range of A.D. 700 to A.D. 1800 can be assigned based on cultural association as evidenced by Patayan/Yuman ceramic production, leaving an appreciable gap of time prior to the earlier date to be studied (Water 1982; Seymour 1997).

As for the relatively recent Native-Historic Style, fur trappers, beginning with Jedediah Smith in 1826, were the first Euroamerican incursions into southern Nevada, passing to the north and south of the NAFR (Belshaw and Peplow 1980). Antonio Armijo later established a trade route, the Old Spanish Trail, between Sante Fe and Los Angeles (Hafen and Hafen 1954). Euroamerican presence steadily increased after military explorer Capt. John C. Fremont traversed and wrote about the region, passing through the NAFR from north to south (Fremont 1845). Establishment of Mormon settlements in the Las Vegas and Moapa Valleys in the 1850s and '60s brought further contact with indigenous populations (Paher 1971).

To date, no direct radiocarbon dates have been obtained for pictographs in the southern Great Basin, but chronometric age determinations have been derived for abstract and representational elements that suggest an older date range than previously hypothesized. Working both inside and outside the area of Coso Representational Style influence, Dorn and Whitely (1983, 1984; Whitely and Dorn 1987) have thirteen dates acquired by using the cation-ratio technique which suggests a range of 8050 B.C. to A.D. 1625 for Heizer and Baumhoff's (1962) Great Basin Curvilinear Abstract Style. The sampling of five rectilinear abstract elements allude to a chronometric age range of roughly 2800 B.C. to A.D. 1750. One tested representational element had a date of A.D. 1370.

Based on both the relative and the few chronometric dates for the petroglyph/pictograph styles briefly discussed, it is possible to formulate a chronometrically testable chronology for the various styles outlined above. The proposed chronology follows:

Western Archaic Abstract Style (Great Basin Abstract)
    Curvilinear Abstract - 8050 B.C. to Contact
    Rectilinear Abstract - 2800 B.C. to Contact
Fremont Representational (includes Puebloan Painted) - A.D. 500 to A.D. 1300
Virgin Representational (includes Puebloan Painted) - 300 B.C. to A.D. 1150
Pahranagat Representational - 300 B.C. to A.D. 500
Coso Representational - 4450 B.C. to A.D. 1370
Colorado River Style - A.D. 700 to A.D. 1800
Great Basin Scratched and Great Basin Painted - A.D. 1000 to Contact
Native-Historic Style - A.D. 1820 +

This chronology recognizes that both the curvilinear and rectilinear abstract styles are a subset of the Western Archaic Abstract Style. Further, curvilinear is older than the rectilinear, both styles lasted an extended period of time, and both had influence on and/or co-occurs with other styles. Except for the Coso, Colorado River, and possibly the Native-Historic Styles, all of the other petroglyph/pictograph styles have been identified on the NAFR and/or overflight lands. It is possible that the three former styles may be identified with additional inventory and/or site characterization.

12.3 CHRONOMETRIC ORIENTED RESEARCH QUESTIONS FOR THE NAFR

Given the refined chronology presented above for the various petroglyph/pictograph styles,

it is possible to pose research questions that will help direct any effort to obtain chronometric age determinations in the future. The following questions pertain to the NAFR and adjacent overflight lands to the north and east of the NAFR.

Question 1. *While relative chronologies have implied and a limited number of chronometric age estimates have essentially supported the thesis that curvilinear abstracts are older than rectilinear abstracts, will dates obtained from Western Archaic Abstract Style sites adhere to or differ from the proposed chronology?*

Question 2. *Will chronometric age determinations recovered from Fremont Style sites correspond with the A.D. 500 to A.D. 1300 range and/or will some dates be older than the A.D. 500 date?*

Question 3. *Will chronometric age determinations obtained from Pahranagat Style representational elements fall within the date ranges argued by Heizer and Hester (1974), or will the dates be older than proposed?*

Question 4. The Pahranagat Style appears to be located in an overlapping interaction zone between the Fremont and Virgin Anasazi. *Will absolute dates recovered from Pahranagat Style elements correspond more to proposed Anasazi or Fremont dates?*

Question 5. *Should Coso Style representational bighorn sheep depictions be identified on the NAFR, will these elements date at A.D. 1000 or later advocating possible Numic entry into this area in support of or contrary to the Numic spread controversy* (see Madsen and Rhode 1994)?

Question 6. *Will dates collected from Colorado River Style elements correspond with the range offered in this document, or will they be younger or older than the proposed A.D. 700 date?*

Question 7. *Thought by some to be associated with the Western Archaic Abstract Style rather than a separate style, will pigment elements of the Great Basin Painted Style be younger than the A.D. 1000 date offered here and by Heizer and Baumhoff (1962)?*

Question 8. *Due to the thin line consistency of Great Basin Scratched, can dates be obtained from scratched elements, and will such dates reflect the chronology offered here?*

12.4 RECOMMENDATIONS FOR CHRONOMETRIC DATING IMPLEMENTATION

In order to implement any type of chronometric dating scheme for petroglyphs and/or pictographs within the boundaries of the NAFR and adjacent overflight area, the following recommendations should be considered.

□ The chronology and associated research questions proposed above are tentative and subject to reevaluation given the continually changing nature of dating techniques, the addition of new data to the problem domain, and the orientation of the researcher or agency needs.

□ Any chronometric dating project should use an interdisciplinary approach to the problem that includes archaeologists, geologists, chemists, and ethnographers.

□ At the same time, the Native American community must become an active participant in this problem domain, and the results must be relevant to their concerns and must consider their unique perspective (see below).

□ Some dating techniques require the removal of samples directly from the petroglyph or pictograph in varying degrees of sample size. To lessen the concerns of agency managers, review agencies, and the public or special interest groups related to potential effects that sampling may have, the rock panel and element to be sampled should be photographed before and after sampling for comparative purposes. Additionally, a detailed measured drawing should be made of all sample panels. As a matter of perspective, however, it must be remembered that petroglyphs/pictographs are affected by constant environmental factors that contribute to their degradation. Unfortunately, human-caused impacts also have an adverse effect on petroglyph and pictograph sites. The gains in knowledge must be weighed against the eventual loss of such sites through environmental and human impacting variables.

□ Selected petroglyph/pictograph sites should have relatively intact archaeological components that include temporal and diagnostic artifacts, stratigraphic deposits, and features. Temporal artifacts can supply relative dates as well as, in some cases, chronometric dates. Standard radiocarbon dates can be recovered from stratified deposits in a limited testing program designed to supplement the petroglyph/pictograph research. Dates and information obtained from a holistic approach will not only contribute to chronological studies but also help interpret the functionality

of such sites. To this end, petroglyph/pictograph sites located on the NAFR with its controlled access policy are well suited for this type of study.

□ Recognizing that a single petroglyph/pictograph site may contain numerous elements created at different times over an extended period, a phased approach should be taken to any chronological study of petroglyphs/pictographs. First, standard relative analytical methods should be employed to characterize the site's petroglyphs/pictographs. By doing so, it would be possible to determine the dominating style as well as the oldest and most recent addition. Chronometric techniques could then be applied to selected petroglyphs and/or pictographs as being representative of the site.

□ Before comparing several petroglyph/pictograph sites, it is first necessary to understand the chronology of one site. A goal of any future chronometric dating project should be to comprehend the total range of dates at one site, thus giving definition to the various episodes of petroglyph/pictograph production and the "life" of a site.

□ Ideally, a multiplicity of direct and indirect chronological techniques should be used as a comparative cross-check. The Principal Investigator must, however, control the exchange of information between technique researchers to prevent data adjusting and to insure data integrity that results in an accurate site chronology and petroglyph/pictograph chronometric interpretation.

13.0 SUMMARY AND RECOMMENDATIONS

Archaeologists from HRC thoroughly documented and collected data from four selected petroglyph and pictograph sites as a comparative study on behalf of and under the auspices of the NAFB CRP. Two of the study sites are on the NAFR, Civet Cat Canyon and Airfield Canyon, and two are on adjacent overflight lands administered by BLM, Red Pigment Canyon and the White River Narrows. Conducted as part of proactive archaeological research and cultural resource site management under provision and intent of NHPA Section 110, the project's work initially focused on three objectives. These included: 1) determining sonic boom effects on rock formations containing petroglyphs/pictographs; 2) contrasting site preservation given two different land management strategies, restricted vs. unrestricted access; and 3) collecting petroglyph/pictograph and, to a lesser degree, obsidian and/or charcoal samples for the purpose of chronometric age determinations. A research strategy and questions, developed and approved prior to implementation of the field phase, guided the researchers in data collection.

Completion of the fieldwork phase allowed the collection of comparative data to address stated research questions. Data derived from standard observations were used to partially address those questions related to chronometric age determinations. As a result of the fieldwork, a total of 106 petroglyph and/or pictograph panels were recorded. Depicted on those panels were 868 identifiable elements that allowed the sites to be characterized into specific styles. It was determined that careful observation of geological phenomena at each site, as well as a control site outside of approved sonic boom locations, failed to yield a single instance of rock panel degradation that is inconsistent with natural weathering and chemical alteration processes. There is no indication that sonic booms have contributed detrimentally to the preservation of petroglyphs/pictographs on reasonably solid rock faces.

It was also determined that the four study sites have suffered from various human-caused impacts, a direct reflection of two separate land management strategies. The two NAFR sites have been impacted by military activities, but cultural resource features and material remain relatively undisturbed due to NAFB's restricted access policies. Study sites situated on adjacent overflight, public domain lands suffer from a general lack of material remains, and the petroglyph/pictograph

panels generally suffer from the addition of modern painted or scratched graffiti. The general degradation of cultural resource sites on unrestricted public lands is proportionate to accessibility, those sites closest to a paved or graded road receiving the greatest impacts.

Using conventional chronological measures rather than more precise chronometric age determinations as initially proposed, it is postulated that the four study sites varied in relative age, the two NAFR sites being older than the two non-NAFR overflight area sites. Dominated by curvilinear and rectilinear abstract element designs, respectively, the Airfield Canyon and Civet Cat Canyon sites are typical of the Great Basin Abstract Style and are most likely Western Archaic in age. Although abstract elements are present at the two non-NAFR overflight sites, representational elements have a greater manifestation. Red Pigment Canyon is typical of the Pahranagat Representational Style, a poorly defined style unique to the Pahranagat Valley. This study site appears to date from the Late Archaic and continues to the early Historic period. Collectively, the three loci studied at the White River Narrows are generally representative of the Great Basin Representational Style with a Fremont/Puebloan influence, probably dating from the early Basketmaker phase to the end of their influence.

During the latter part of the field phase, the chronometric age determination objective was canceled in lieu of additional chronometric research, provided within this document as a model and additional research questions. Provided are brief reviews of known dating techniques. Petroglyph/pictograph style is discussed as a temporal and cultural indicator leading to a refined chronology for various styles thought to be or possibly present within the boundaries of the NAFR and adjacent overflight lands. Research questions are posed to test the chronology.

Finally, using established criteria of evaluation, three of the study sites are recommended as being eligible for nomination to the National Register, one site being currently listed. It was determined that three sites, Civet Cat, Airfield, and Red Pigment Canyons, are eligible for nomination to the National Register under Criteria (a) and (d). Although the White River Narrows is currently listed on the National Register under Criterion (d), it is probably also eligible under Criterion (a) for its religious and cultural significance to Native Americans.

13.1 RECOMMENDATIONS

Even though this project has contributed to the study of petroglyphs and pictographs in southern Nevada, it is a baby's first teetering steps. While relative chronologies remain important goals in our comprehension of the subject matter, direct chronometric age determinations are also crucial to archaeologists and the interested American public as evidenced by articles in journals such as the *National Geographic* and through television documentaries. Chronometric dates will help in understanding both time and space in relation to petroglyphs and pictographs. It is important that sites selected for chronometric sampling contain undisturbed archaeological collections in order to develop a clearer appreciation of the social, economic, and ideological context within which petroglyph/pictograph sites were created. Chronometric dates, along with traditional archaeological methods associated with site testing, will allow site placement within or help develop regional chronologies, which are lacking or poorly defined in many parts of Nevada. Additional projects should also continue to define stylistic categories throughout Nevada and the Great Basin on a site-by-site basis to better recognize the distribution of elements and styles upon the landscape.

In opposition, the Native Americans participating in this project do not agree with this aspect on the need for chronometric dating. It is their position that "these precious resources should not be disturbed nor subjected to destructive scientific analysis," and because of apparent conflicts, "it is difficult for Indian people to support scientific studies" (Arnold *et al.* 1999). Any future effort at chronometric dating of NAFR petroglyph/pictograph sites must include not only standard archaeological methodology and new chronometric techniques in the pursuit of knowledge, but cooperation and compromise by both the archaeological and Native American communities as well as incorporation of Native American perspectives. Given that cultural resource sites are repositories of significant data and are endowed with both physical and spiritual meaning, special interest groups are not the sole proprietors or arbitrators of those sites or their meaning, nor do they have exclusive rights to the past as no one truly "owns" the past (Davis *et al.* 1999). Rather, as native-born Americans, we all have a vested interest in our common American heritage by birthright and the cultural resource sites, either prehistoric or historic, that make up that heritage. The task before archaeologists is to make archaeological research more relevant to the Native American community

and to accommodate their values and views. At the same time, the Native American community needs to help archaeologists incorporate traditional histories, cultural practices, and alternative interpretations different from those represented by collected scientific data. Through interaction, cooperation, and compromise, science and Native American traditional views can complement rather than compete. Without this, the resources will continue to suffer and the division will continue to grow.

Several recommendations are made to achieve a compromise position. From an archaeological standpoint, it will be necessary to thoroughly evaluate the accuracy of the various dating methods. Once a method is selected, "efforts should be made to educate Indian people about the nature of the studies and what exactly is involved" (Arnold *et al.* 1999), and the Native Americans to educate scientists concerning cultural sensitivity. Site selection and the criteria for selection should involve Native Americans, NAFB, and the archaeological community. Once a site is chosen, a systematic ethnographic study should be conducted prior to any disturbance to "better understand the cultural significance of areas to be impacted" (Arnold *et al.* 1999). Together, the archaeological and ethnographic data will contribute to a mutual understanding.

There is no indication that military-related sonic booms have contributed detrimentally to the preservation of petroglyph/pictograph sites on the NAFR. This conclusion was based on visual observations of similar physical properties made at the four study sites and a control site in comparison. Based only on single site visits, it would be necessary to monitor a site over an extended period of time to validate this conclusion. To eliminate sonic booms as a factor for cultural resource site degradation, it is recommended that a long-term monitoring program be established at a site subject to frequent and high-intensity sonic boom noise and vibration. Such a program should include a multi-disciplinary team consisting of no less than a geomorphologist, an acoustic engineer, and an archaeologist. The project would be based on hard data recording through various motion/noise sensing equipment as well as observation of physical properties over an extended period of time.

Each of the four study sites has been affected by human activity and natural environmental factors. Human activity, past or recent, has contributed to site formation. Degradation of a petroglyph/pictograph site is difficult and expensive to prevent or, at least, control and should not

be attempted without consultation with experts trained in site conservation. Certain forms of negative human behavior such as spray painting or building camp fires under petroglyph/pictograph panels can be lessened by active monitoring and prosecution programs. Such unfortunate activity does not appear to be a problem on the NAFR but is always a possibility for BLM managed resources. This project has provided both NAFB and the BLM archaeologists with accurate site forms, base line data, from which to evaluate future human activity at these sites. As documentation of the impacts, the site records act as a form of mitigation. The mitigation of ordnance impacts at Civet Cat Canyon is here considered unnecessary as they have become part of the site's history and cultural context. Should such mitigation be proposed, it needs to be done with the advice of a cultural resource conservation expert. It is felt, however, that NAFB and Ely District BLM are managing the sites studied as part of this project in an appropriate and realistic manner given the monetary resources and the number of cultural resource sites entrusted to these agencies.

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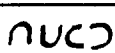
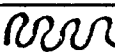
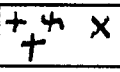
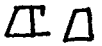
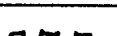
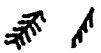
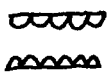
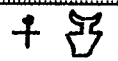
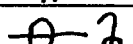
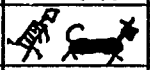
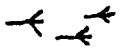
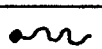
APPENDIX A

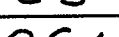
DESIGN ELEMENT TYPES, NUMBER OF OCCURRENCES, AND DISTRIBUTION BY SITE

DESIGN ELEMENT TYPES, NUMBER OF OCCURRENCES, AND DISTRIBUTION BY SITE								
Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Abstract elements of a circular, curvilinear, or meander shape (petroglyphs).								
Circle		13	7	7			6	33
Attached circles		1	7	3			4	15
Line connected circles			4	2				6
Single tailed circles		7	10	4			1	22
Multiple tailed circles			6	3			2	11
Barbell			1					1
Concentric circles			4	5		1	1	11
Bisected tailed circle		1		3			1	5
Rayed circle/dot		4	6	7			1	18
Internal rayed circle			1					1
Gridded circle							1	1
Gridded oval							2	2
Spiral, left or right			2	2				4
Arc		3	7	11			4	25
Nested arcs			1	3				4
Single wavy line		10	2	9		1	1	23
Multiple wavy line		3		2				5
Meander		6	11	19			1	37

Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Branched Meander		4	9	4				17
Enclosed blob			2					2
Threaded dots							1	1
Patterned dots, grid or linear				11			1	12
Dotted dot				7				7
Total curvilinear shapes.		52	80	102	0	2	27	263
Abstract elements of a straight or rectilinear shape (petroglyphs)								
Cross or X-like		6	1	5		2	1	15
Single vertical line		6	1	12			4	23
Multiple vertical lines		2		10			3	15
Single horizontal line			3	8			2	13
Multiple horizontal lines		1		4			1	6
Single zigzag			1	17		1		19
Multiple zigzag		1	2	1				4
Diagonal lines			3	10			1	14
Rake		2	2	9		1	4	18
Ladder							1	1
Chevron or V-like		2		6			1	9
Bow tie		1						1
Grid or divided box			1	4			1	6

Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Patterned rectangle							1	1
Trapezoid w/ or w/out branch line				1			1	2
U-like							1	1
Squared wavy				1		1		2
Vertical w/ multiple cross lines				1		2		3
Fletched line				5				5
Sharp teeth pattern				1				1
Attached diamonds				4				4
Ticked horizontal line, upper, lower, or combined ticks				3				3
Total rectilinear shapes.		21	14	101	0	7	22	165
Abstract elements containing both curvilinear and rectilinear lines.								
Horizontal line with hanging or mounted bulbs		1		2				3
Reticulate		1	7	6			1	15
Complex line		1	1	1			3	6
Rake w/ wavy or curved tines		1		2				3
Total elements with curvi/rectilinear lines.		4	8	11	0	0	4	27
Representational elements (petroglyphs).								
Anthropomorph, ungendered		1		6			5	12
Anthropomorph, female				5				5

Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Anthropomorph, partial		1		7			1	9
Anthropomorph, Pahranagat patterned body							4	4
Anthropomorph, patterned body, other				1				1
Vulvaform			1	15			9	25
Archer							1	1
Atlatl		1				1	2	4
Mountain sheep		2	1	7		1	26	37
Deer				1			1	2
Misc. warm blooded zoomorph		1				1	3	5
Bird tracks				1				1
Snake		1	1			1	1	4
Lizard-like				3				3
Multiple legged zoomorph (bug)							1	1
Hand print				4			1	5
Foot/paw print				10				10
Plant-like							1	1
Total representational shapes.		7	3	60	0	4	56	130
Scratched elements, curvilinear and rectilinear shapes.								
Single vertical line		2			2	1		5

Type Names	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Multiple vertical lines		3	8	4	3	2		20
Multiple horizontal lines				1		2		3
Multiple diagonal lines			1					1
Multi-converging diagonal lines			1					1
Zigzag				2				2
H-like		1						1
Overturned V		1						1
Cross hatching			1	1				2
N-like					1			1
Circle				1				1
Figure 8		2						2
Wavy line		2						2
Vertical sinuous lines			1	1				2
Total scratched shapes.		11	12	10	6	5	0	44
Pictograph elements, curvilinear and rectilinear shapes and petroglyph infilling/enhancement.								
Curvilinear amorphous shape			3				3	6
Concentric circle							1	1
Circle					4			4
Curvilinear line					5			5
Branching meander					1			1

Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Horizontal line					5	4		9
Vertical or diagonal line					28	4		32
Rake					1			1
Double rake					1			1
N-like					1			1
Zigzag					3	1		4
Triangular					5			5
Grid					1			1
Chevroned vertical line					1			1
Multiple vertical line (grouped)					1			1
Arrow tip					1			1
Three-finger drag					83			83
Petroglyph infilling/enhancement			1	3				4
Total pictograph elements.		0	4	3	141	9	4	158
Historic or recent elements (petroglyphs).								
Name or initials	Billie Bob	13		13	4	19		49
Date	1906	6		8		7		21
Location	Bisbee AZ					1		1
Word or phrase	NO HORSES			4				4
Swastika						1		1

Type Name	Symbol	26NY369	26NY2252	26LN210-I	26LN210-II	26LN210-III	26LN4232	Totals
Zoomorph		1						1
Total historic or recent petroglyph shapes.		20	0	25	4	28	0	77
Grand totals for all types and techniques		115	121	313	151	55	113	868

APPENDIX B

RESULTS OF BETA ANALYTIC'S RADIOCARBON DATING

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

William White — October 26, 1998

University of Nevada — December 2, 1998

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-123681	2190 +/- 140 BP	-25.0* o/oo	2190 +/- 140* BP

SAMPLE #: 26NY2252-1
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

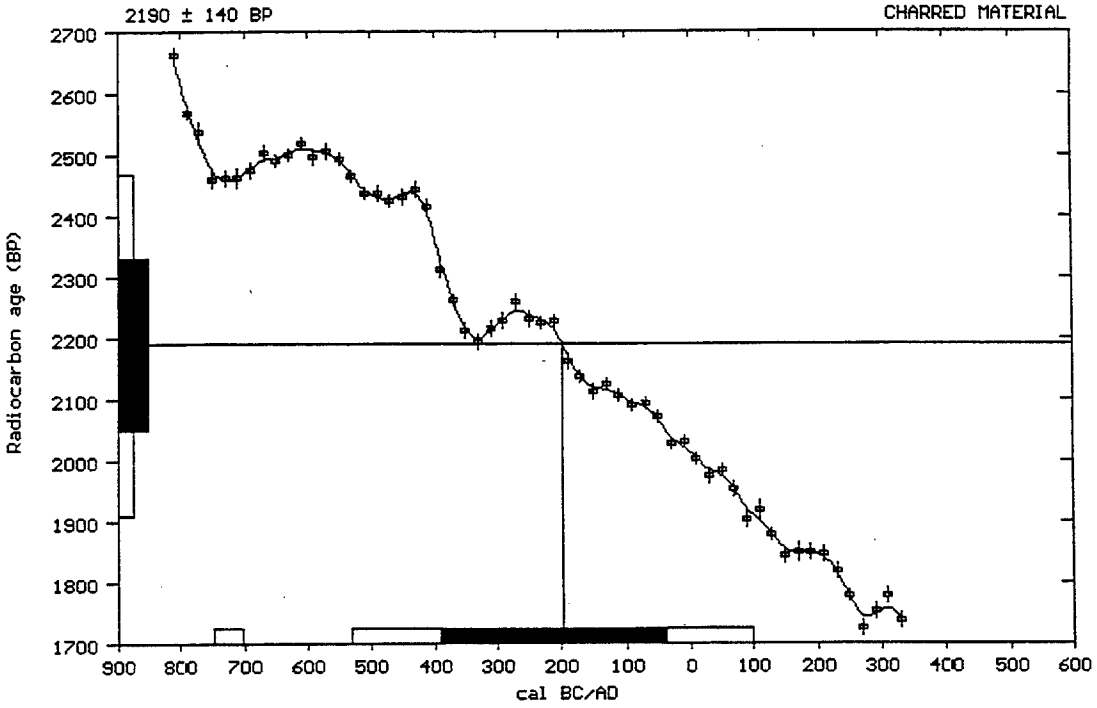
(Variables:estimated C13/C12=-25:lab mult.=1)

Laboratory Number:	Beta-123681
Conventional radiocarbon age*:	**2190 ± 140 BP**
Calibrated results: (2 sigma, 95% probability)	**cal BC 745 to 700 and cal BC 530 to cal AD 100**

* C13/C12 ratio estimated

Intercept data:

Intercept of radiocarbon age with calibration curve:	cal BC 200
1 sigma calibrated results: (68% probability)	cal BC 390 to 40



References:

Pretoria Calibration Curve for Short Lived Samples
Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86

A Simplified Approach to Calibrating C14 Dates
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Calibration - 1993
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 ■ Tel: (305)667-5167 ■ Fax: (305)663-0964 ■ E-mail: beta@radiocarbon.com

BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

Mr. DARDEN G. HOOD
Director

RONALD E. HATFIELD
Laboratory Manager

CHRISTOPHER PATRICK
TERESA A. ZILKO-MILLER
Associate Managers

January 13, 1999

William White
University of Nevada
Harry Reid Center
PO Box 454009
Las Vegas, NV 89154

Dear Dr. White:

Please find enclosed the radiocarbon dating results for two samples of charred material (26LN210B-1 & 26LN21OC-1) which were received on December 3 and quoted a January 22 delivery date. They both provided plenty of carbon for accurate radiometric analysis and all analytical steps went normally. The result for Beta-125115 is reported as a percentage of the reference standard rather than an age (100% being 0 BP years old). This is because the analyzed material contained an average C14 content which was greater than the modern standard. It indicates the carbon analyzed included atmospheric "bomb carbon" generated within the last 40 years, meaning that it was recent material.

Our invoice has been sent separately. A copy is enclosed. Thank you for your prior efforts in arranging payment. As always, if you have any questions, please do not hesitate to contact us.

Sincerely,

Darden Hood

4985 S.W. 74 COURT, MIAMI, FL 33155 U.S.A.
TELEPHONE: 305-667-5167 / FAX: 305-663-0964 / INTERNET: beta@radiocarbon.com
WEB SITE: http://www.radiocarbon.com

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

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4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

William White — December 3, 1998

University of Nevada — January 13, 1999

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-125115	101.9 +/- 0.9 % modern	-25.0* o/oo	101.9 +/- 0.9 % modern

SAMPLE #: 26LN210B-1
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid
COMMENT: reported result indicates an age of post 0 BP and has been reported as a % of the modern reference standard

Beta-125116	470 +/- 60 BP	-25.0* o/oo	470 +/- 60* BP

SAMPLE #: 26LN210C-1
ANALYSIS: radiometric-standard
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

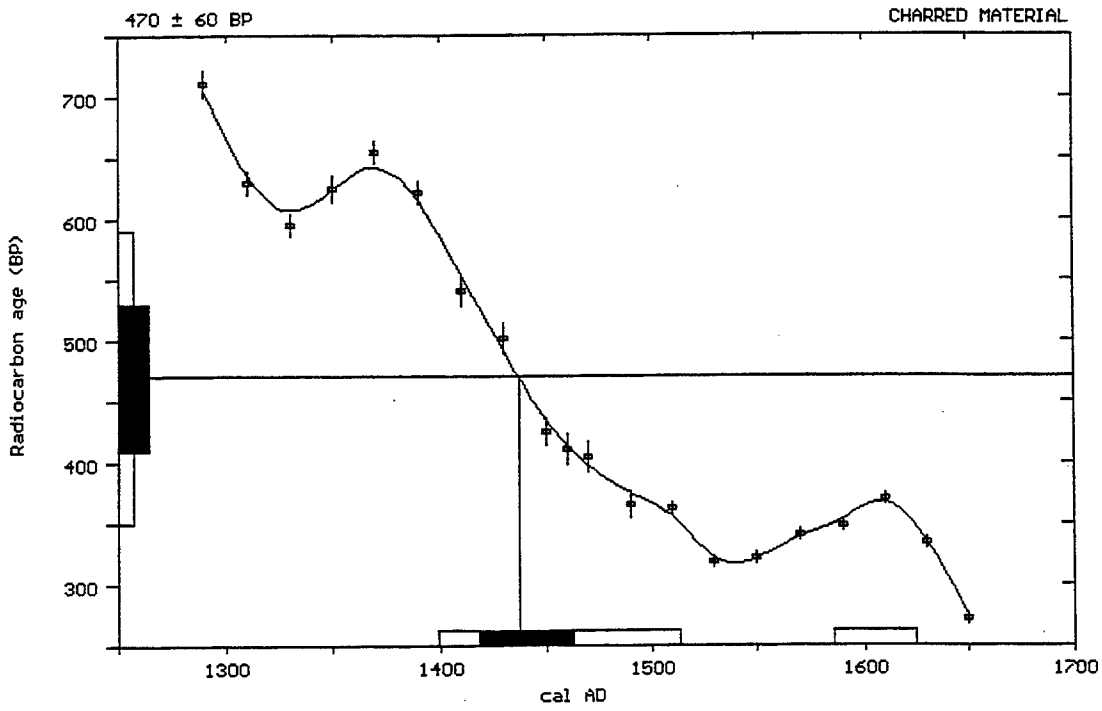
(Variables:estimated C13/C12=-25:lab mult.=1)

Laboratory Number:	Beta-125116
Conventional radiocarbon age*:	**470 ± 60 BP**
Calibrated results: (2 sigma, 95% probability)	**cal AD 1400 to 1515 and cal AD 1585 to 1625**

* C13/C12 ratio estimated

Intercept data:

Intercept of radiocarbon age with calibration curve:	cal AD 1435
1 sigma calibrated results: (68% probability)	cal AD 1420 to 1460



References:

Pretoria Calibration Curve for Short Lived Samples
Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86

A Simplified Approach to Calibrating C14 Dates
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Calibration - 1993
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

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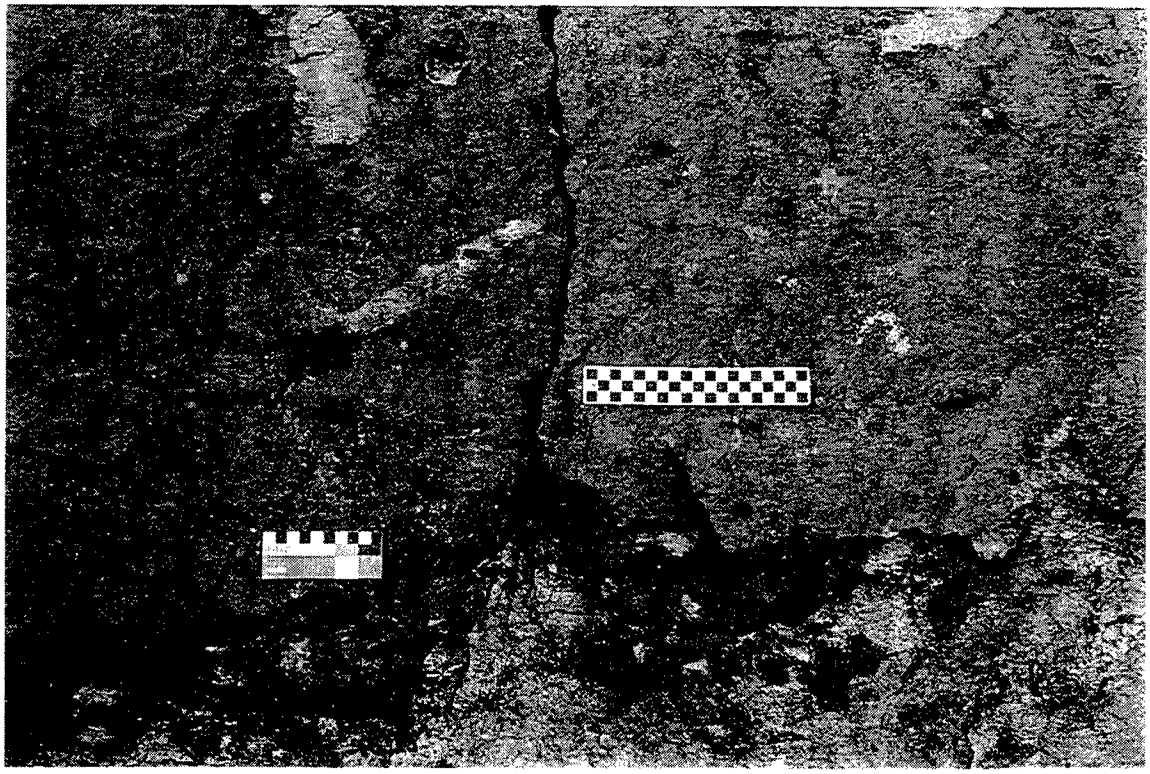
APPENDIX C

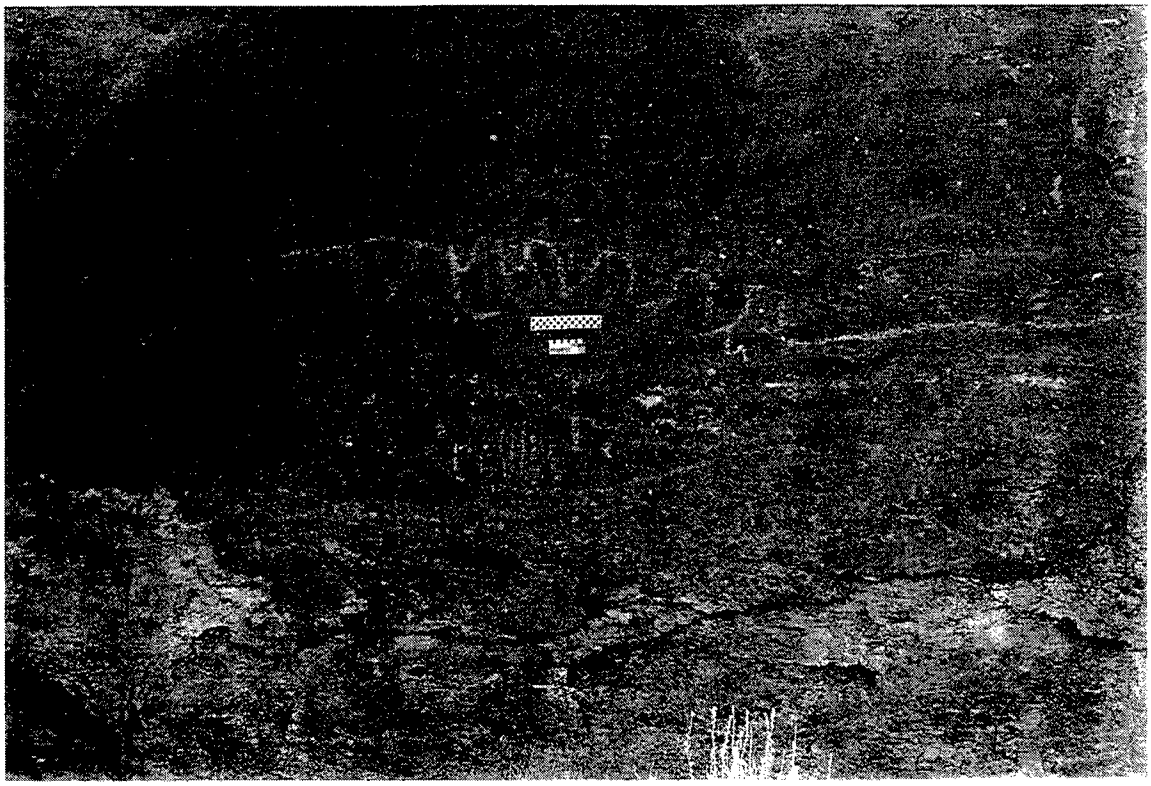
PHOTOGRAPHS OF ROCK ART PANELS

CIVIC CAT CANYON

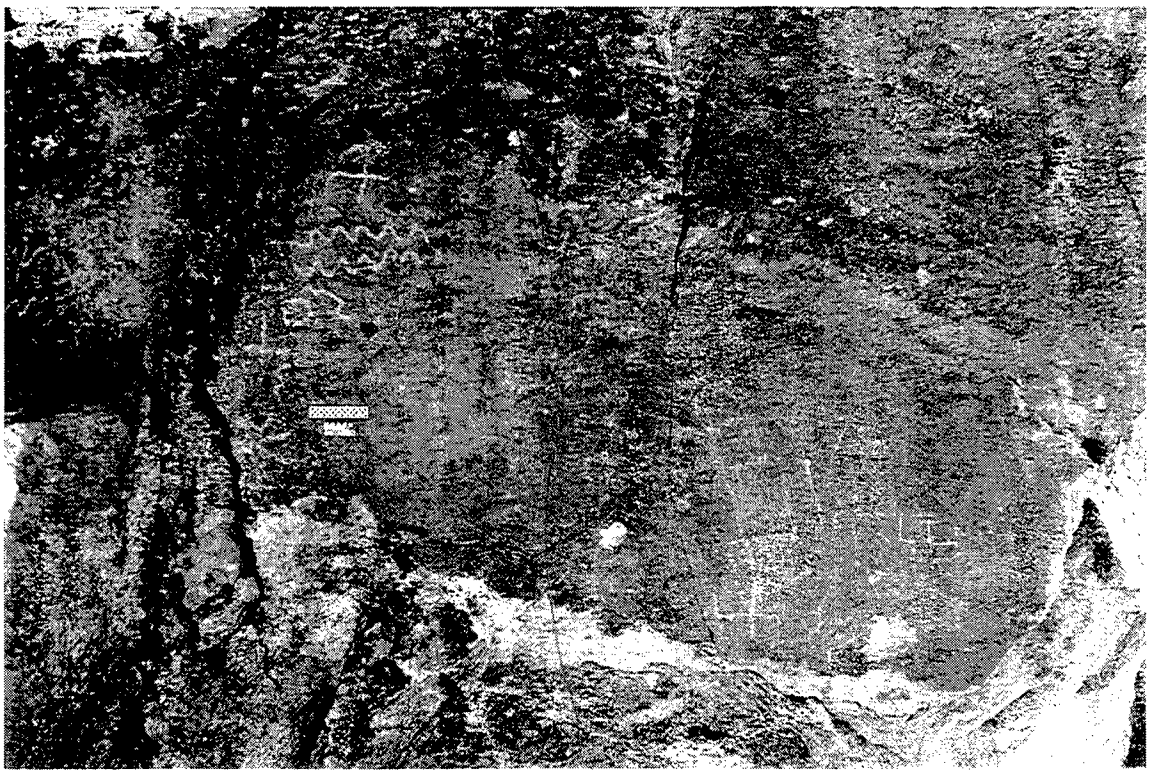
Petroglyph Panel A, Civet Cat Canyon site (26NY369).



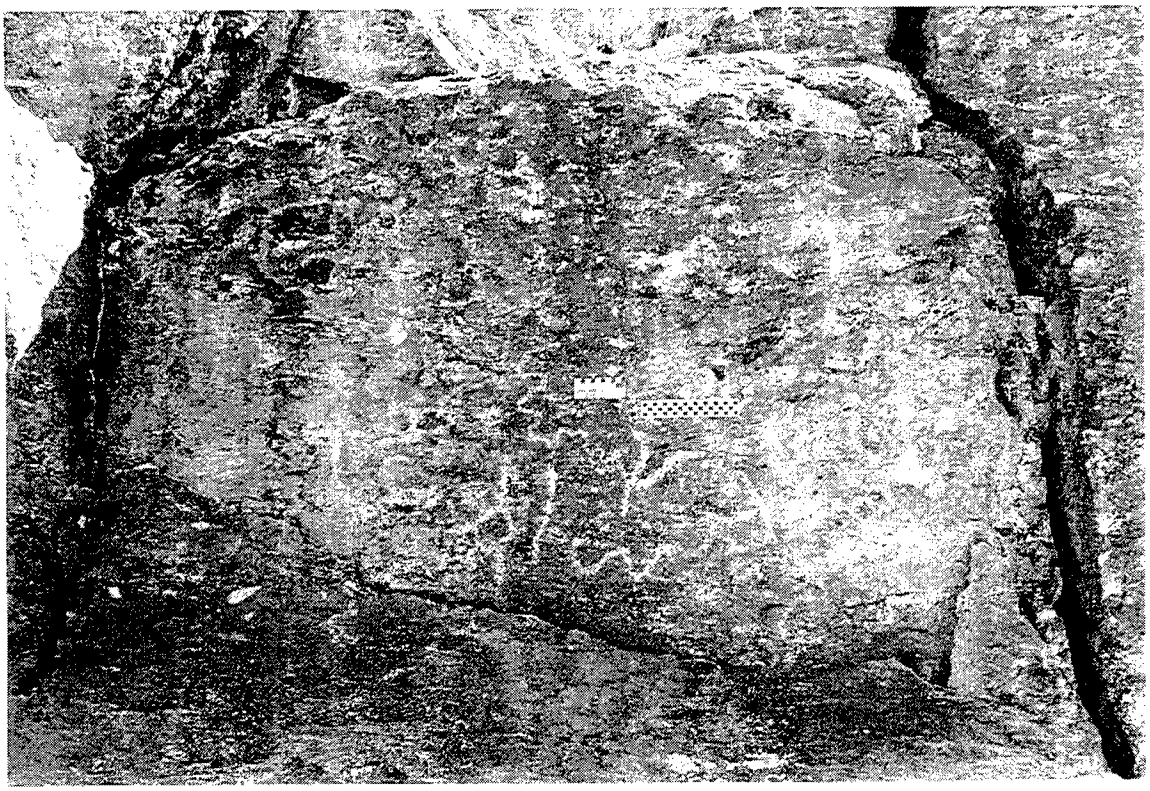
Petroglyph Panel A1, Civet Cat Canyon site (26NY369).



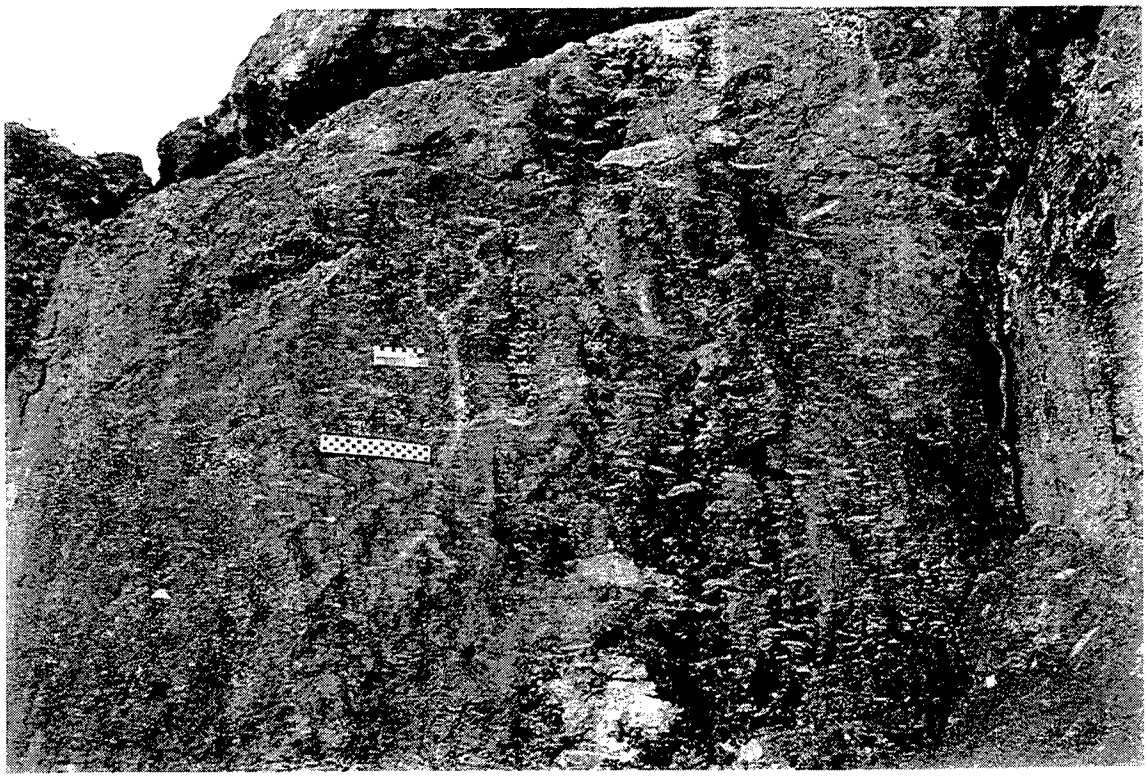
Petroglyph Panel B, Civet Cat Canyon site (26NY369).



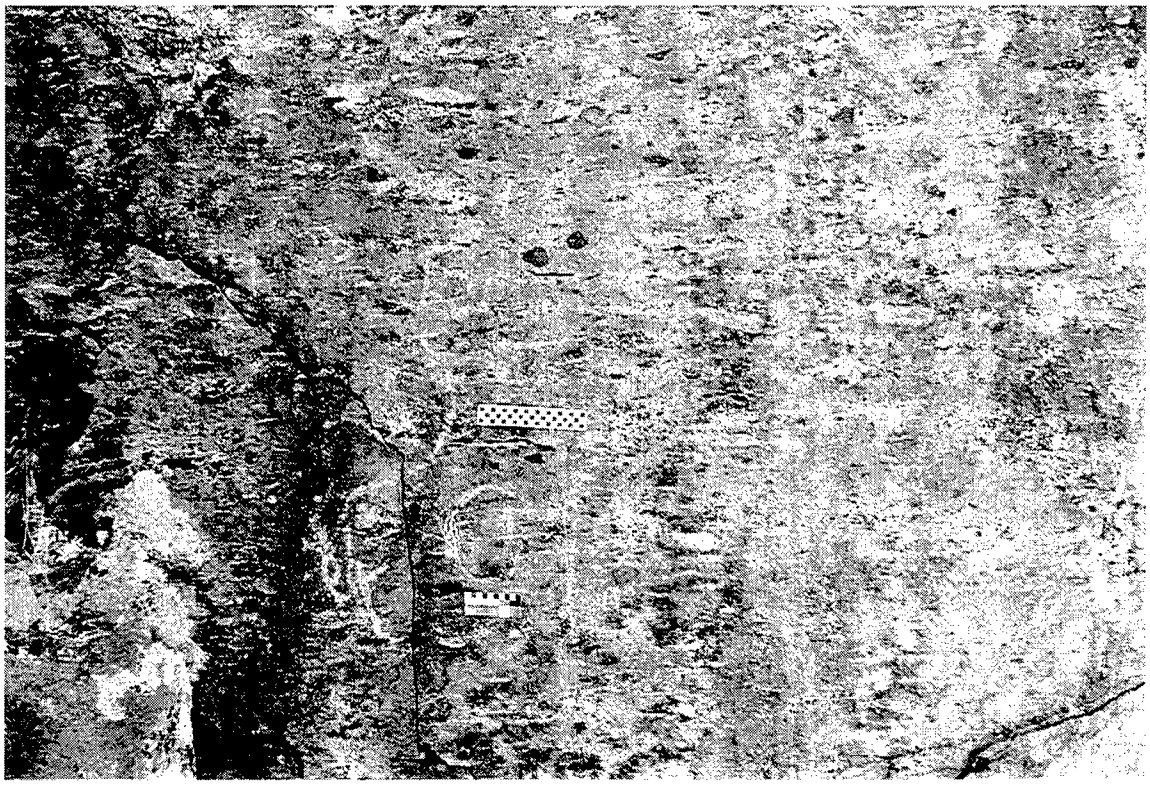
Petroglyph Panel C, Civet Cat Canyon site (26NY369).



Petroglyph Panel D, Civet Cat Canyon site (26NY369).

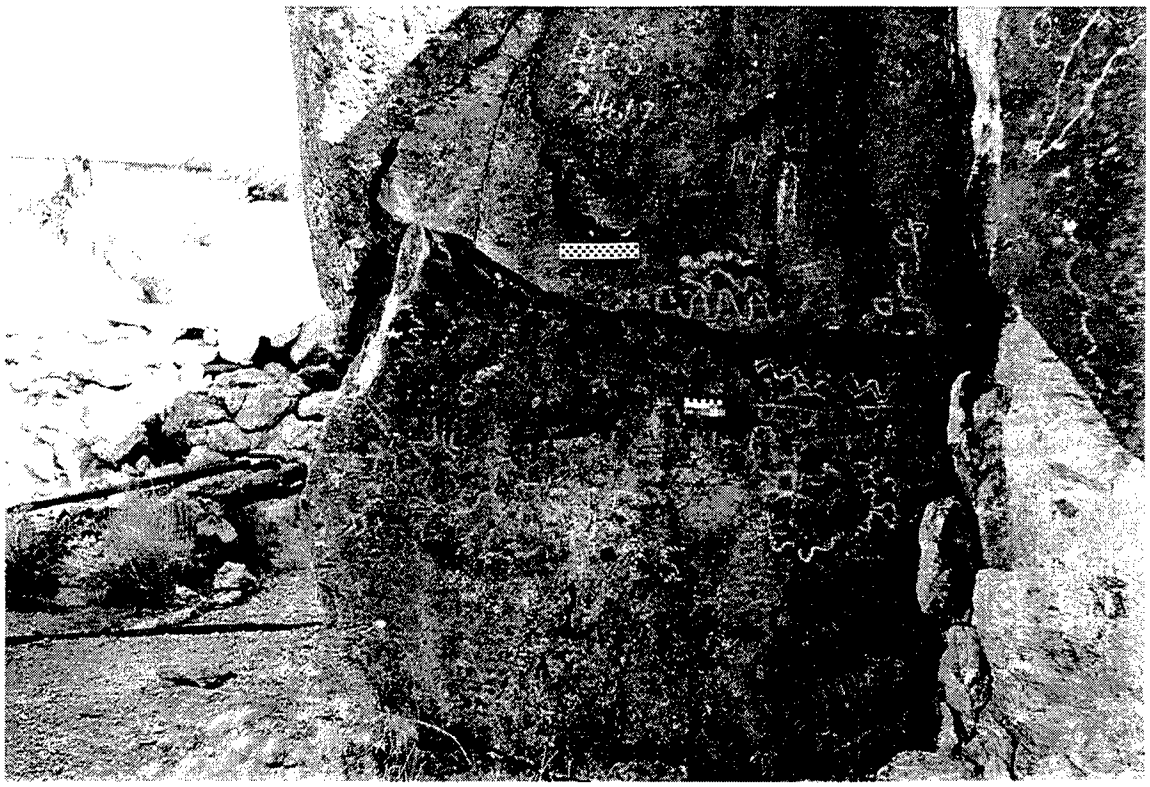


Petroglyph Panel E, Civet Cat Canyon site (26NY369).

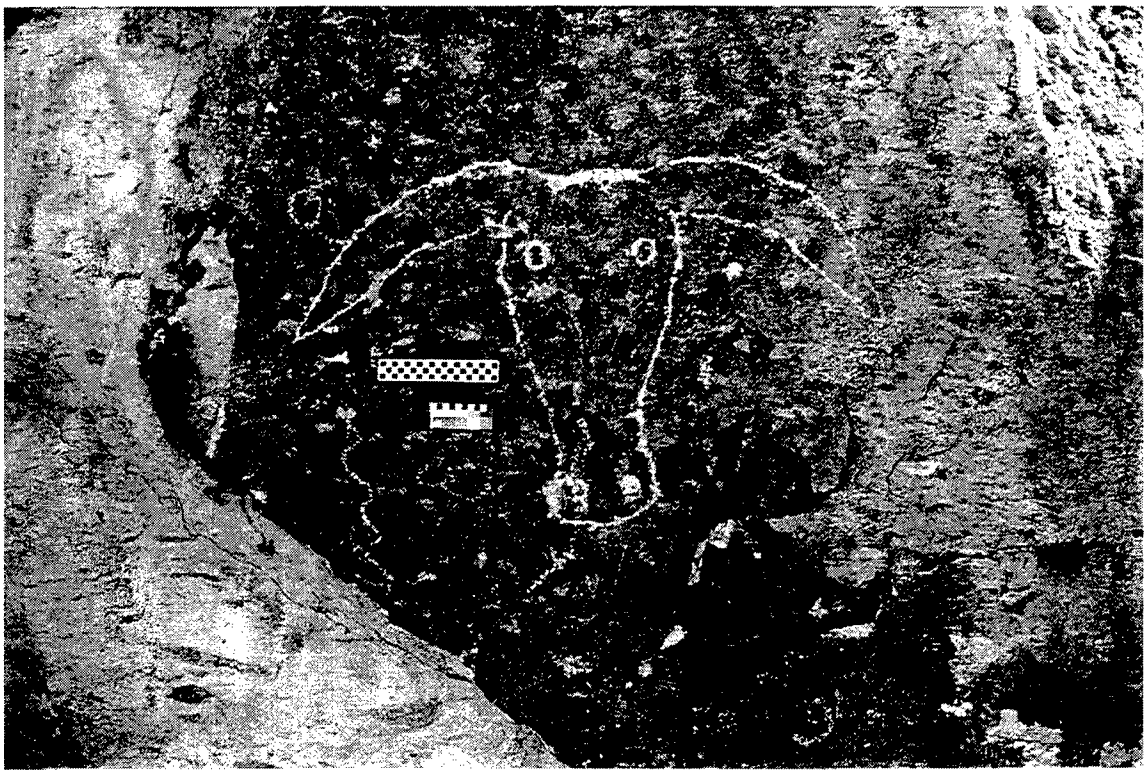


Petroglyph Panel F, Civet Cat Canyon site (26NY369).

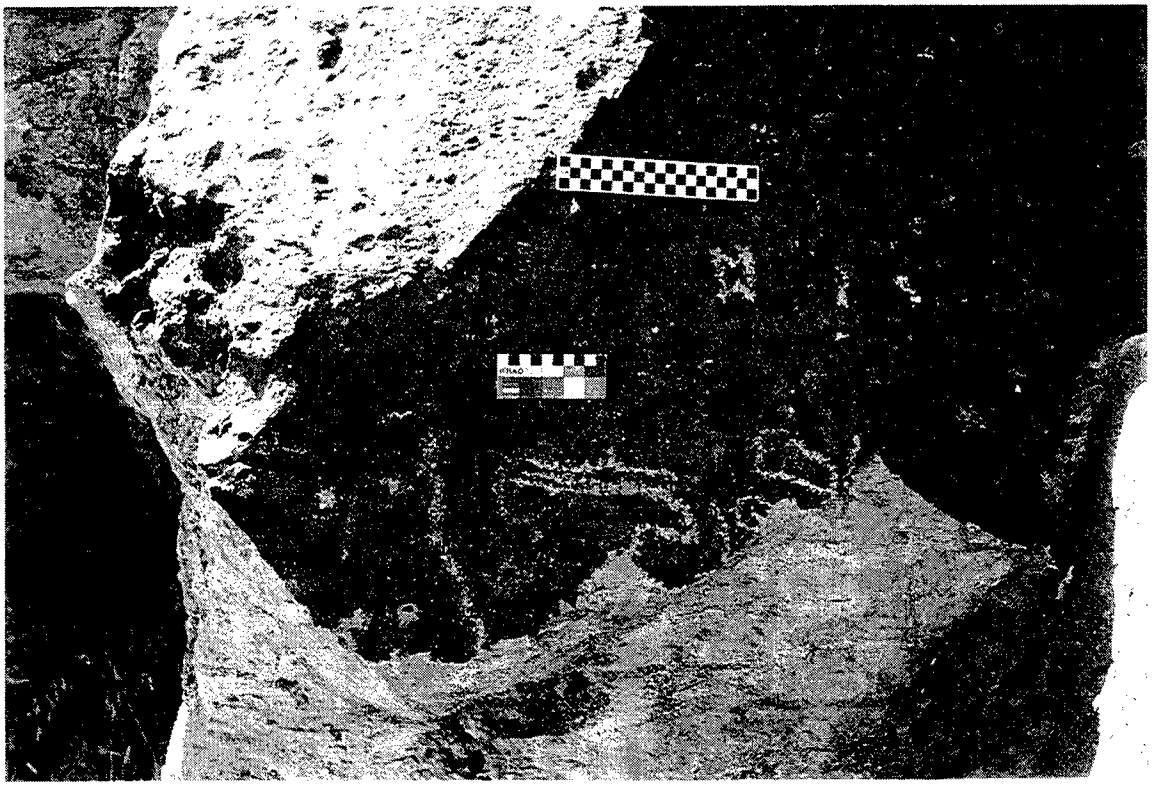
Petroglyph Panel F1 with ordinance impact, Civet Cat Canyon site (26NY369).



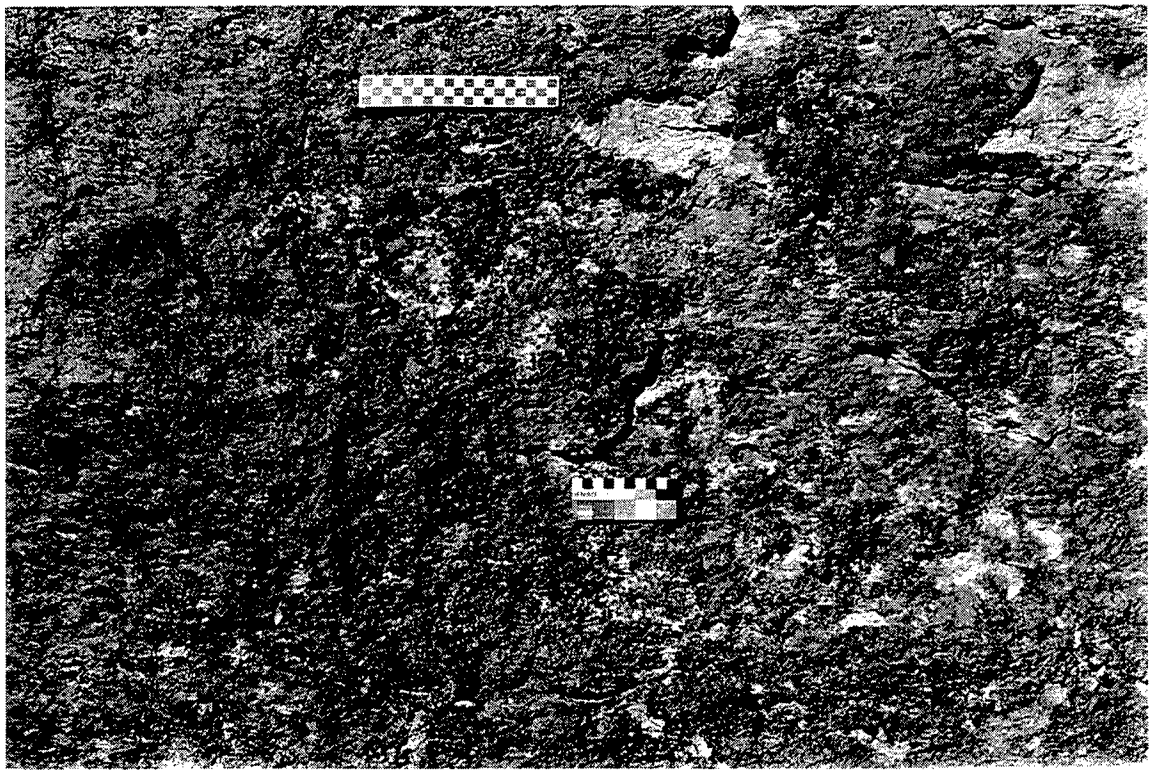
Petroglyph Panel G, Civet Cat Canyon site (26NY369).



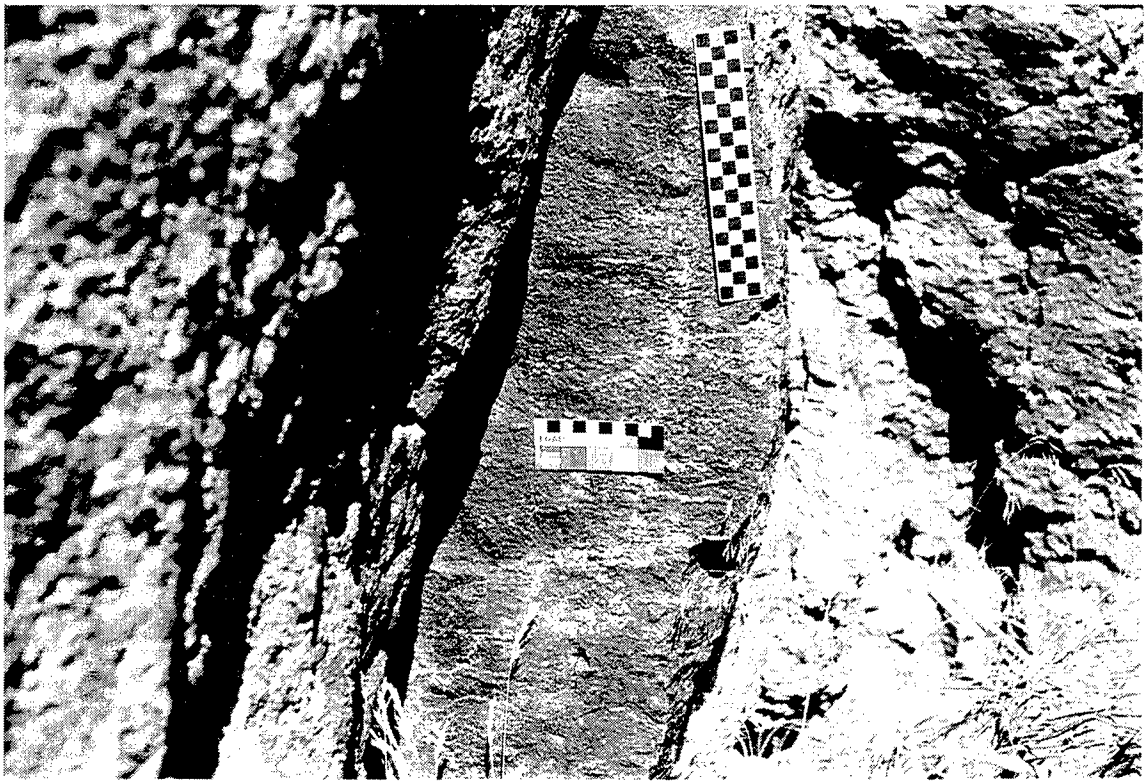
Petroglyph Panel H, Civet Cat Canyon site (26NY369).



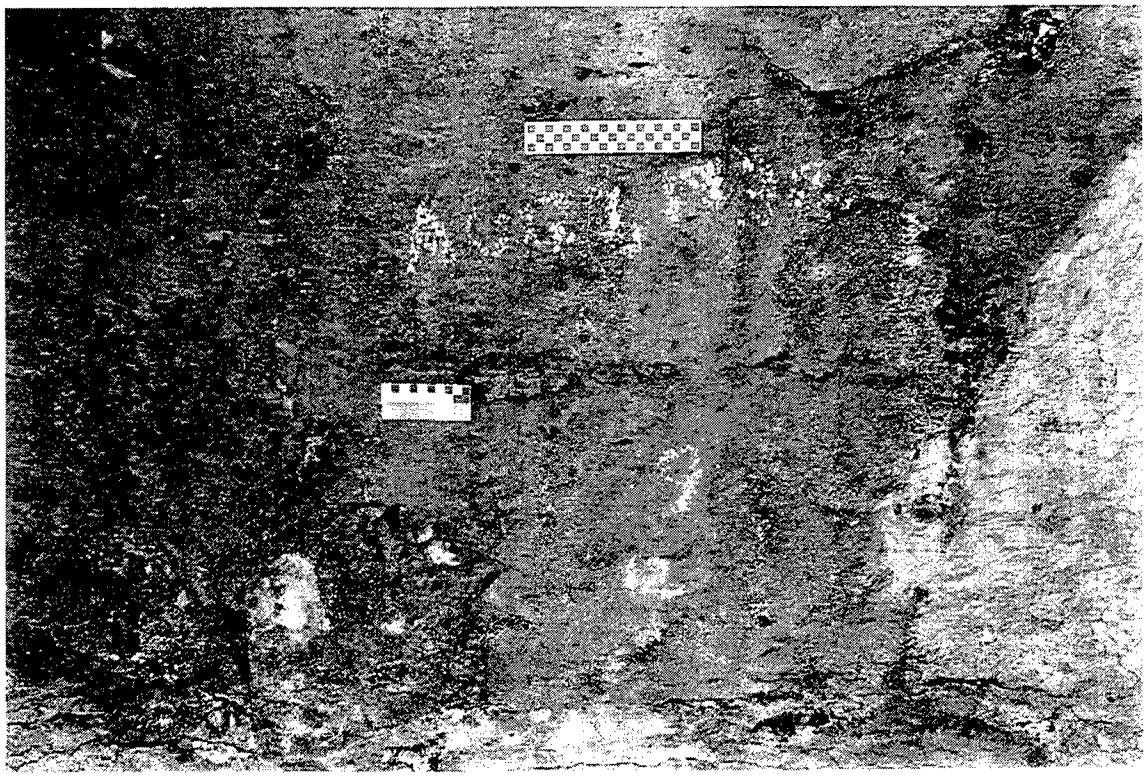
Petroglyph Panel I, Civet Cat Canyon site (26NY369).



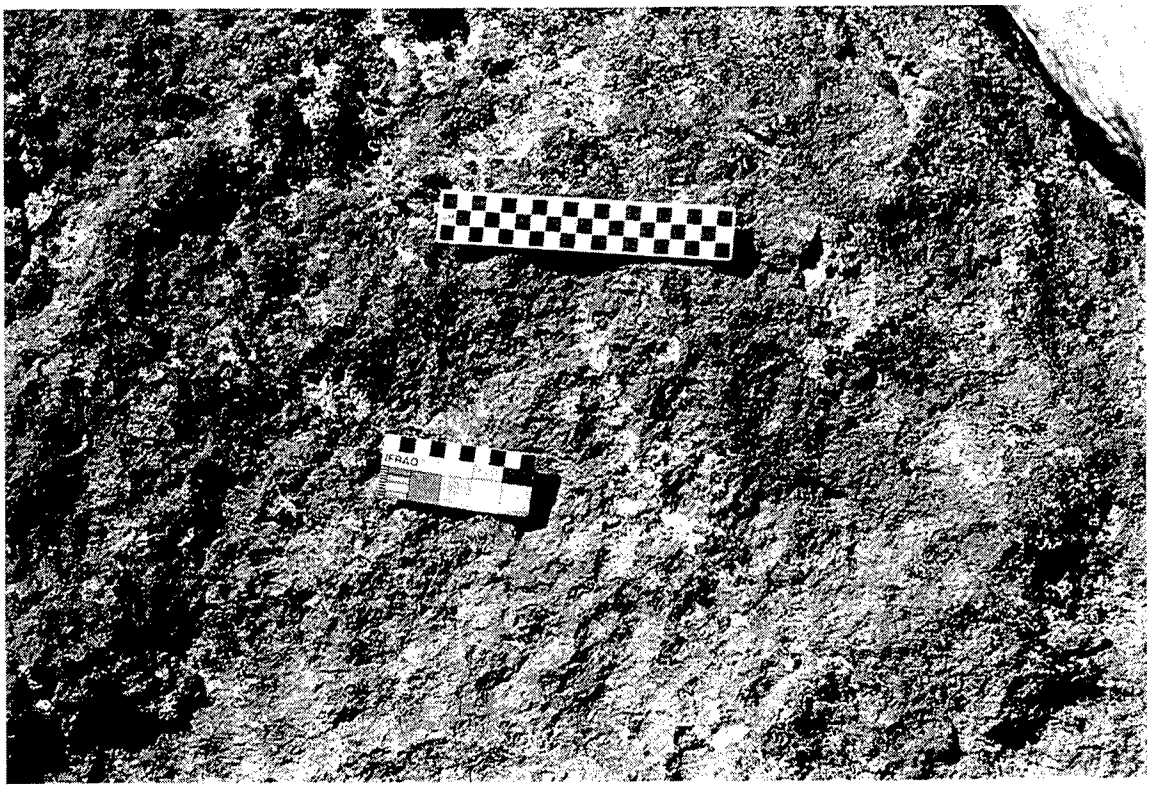
Petroglyph Panel I1, Civet Cat Canyon site (26NY369).



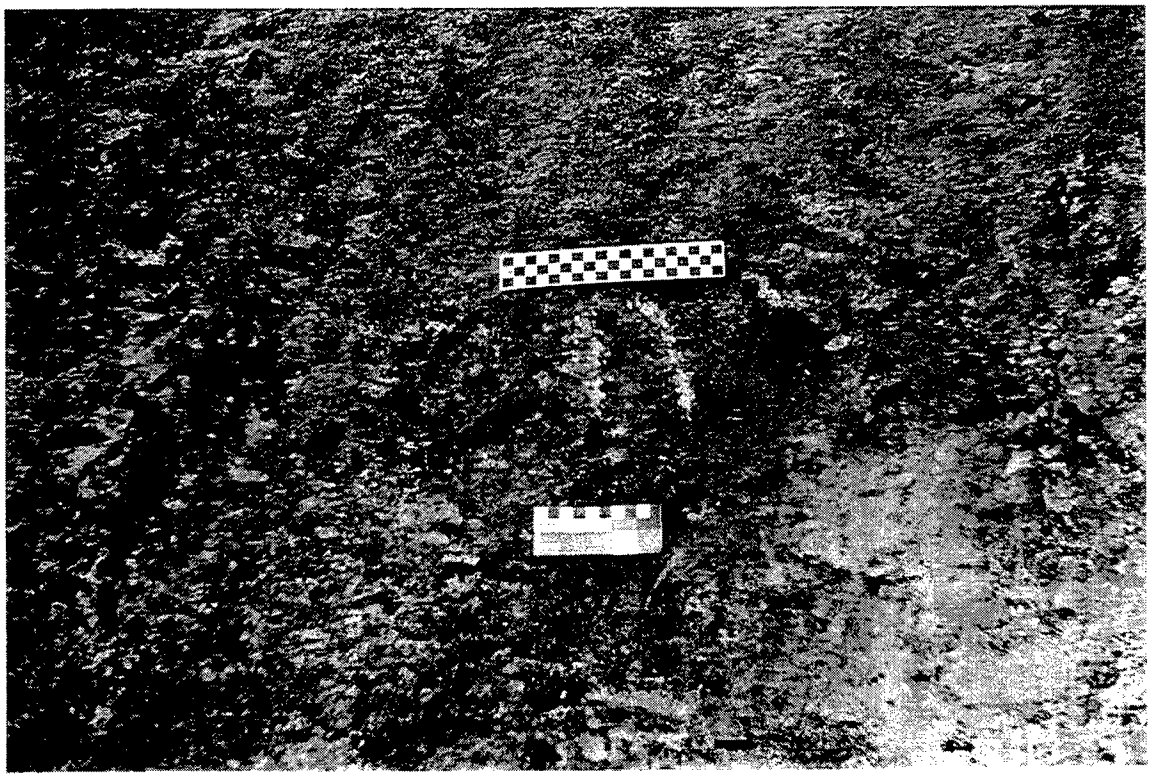
Petroglyph Panel J, Civet Cat Canyon site (26NY369).



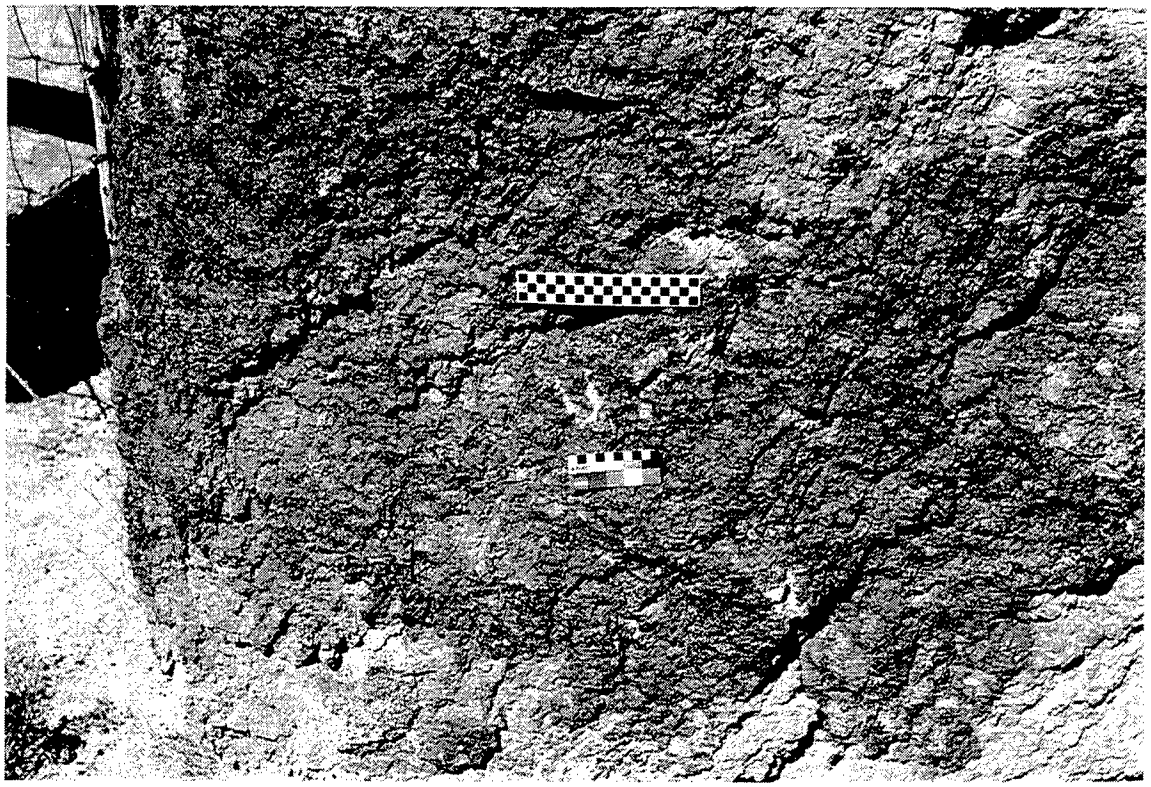
Petroglyph Panel K, Civet Cat Canyon site (26NY369).



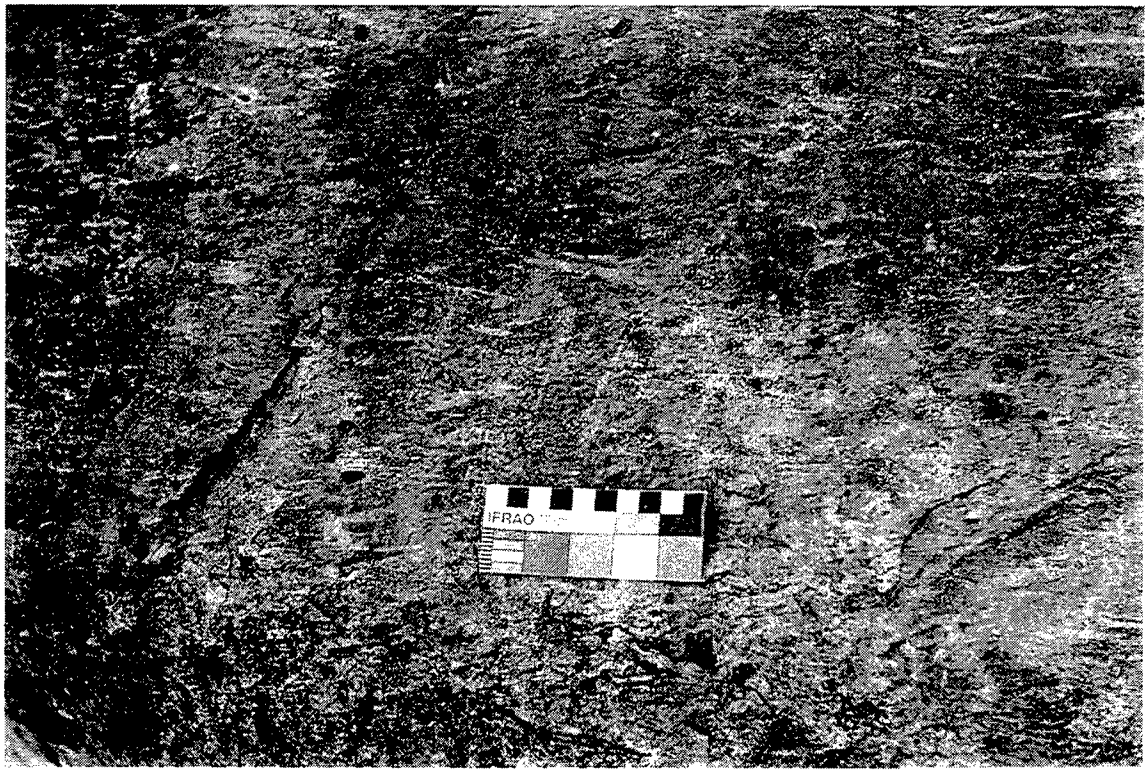
Petroglyph Panel L, Civet Cat Canyon site (26NY369).



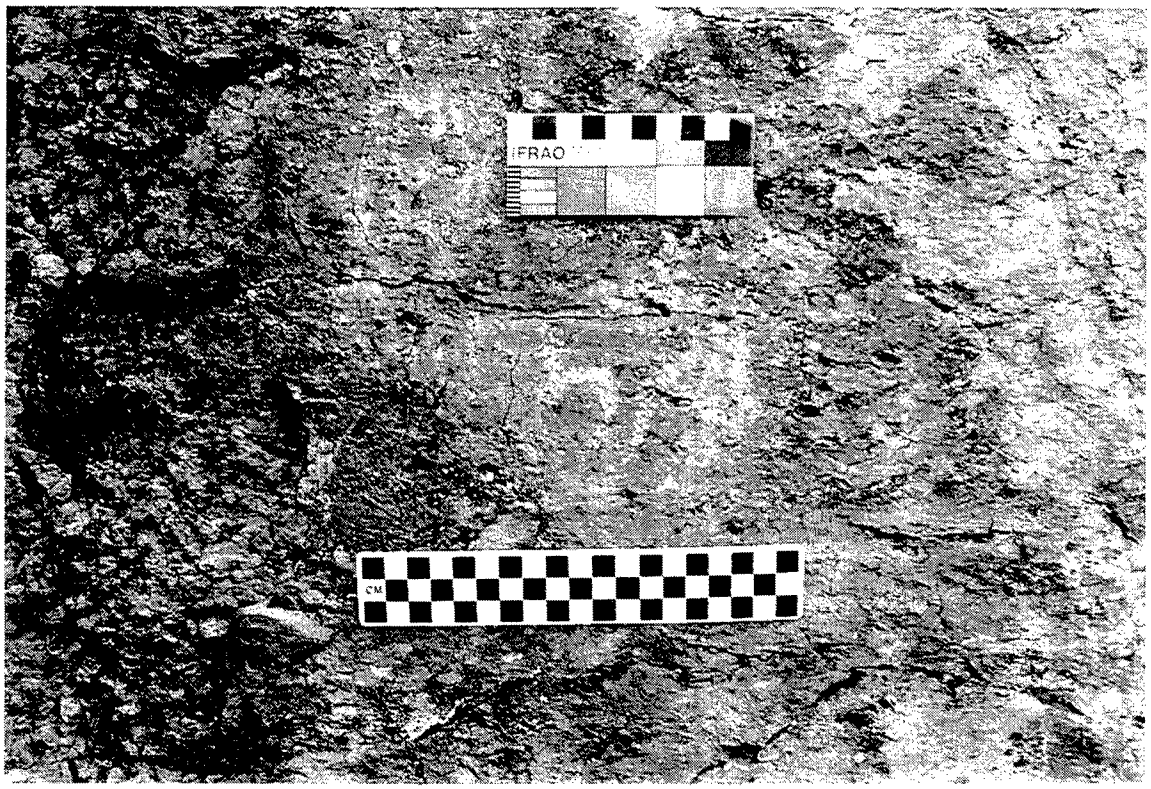
Petroglyph Panel M, Civet Cat Canyon site (26NY369).



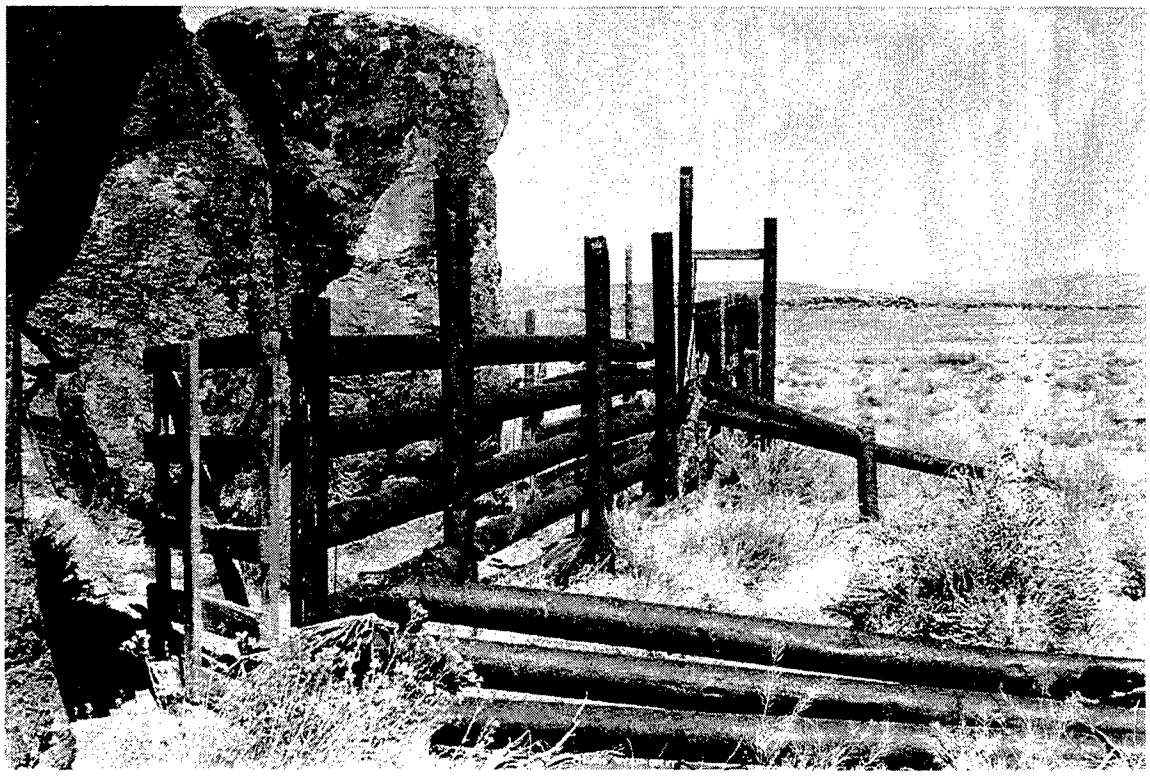
Petroglyph Panel N, Civet Cat Canyon site (26NY369).



Petroglyph Panel O, Civet Cat Canyon site (26NY369).

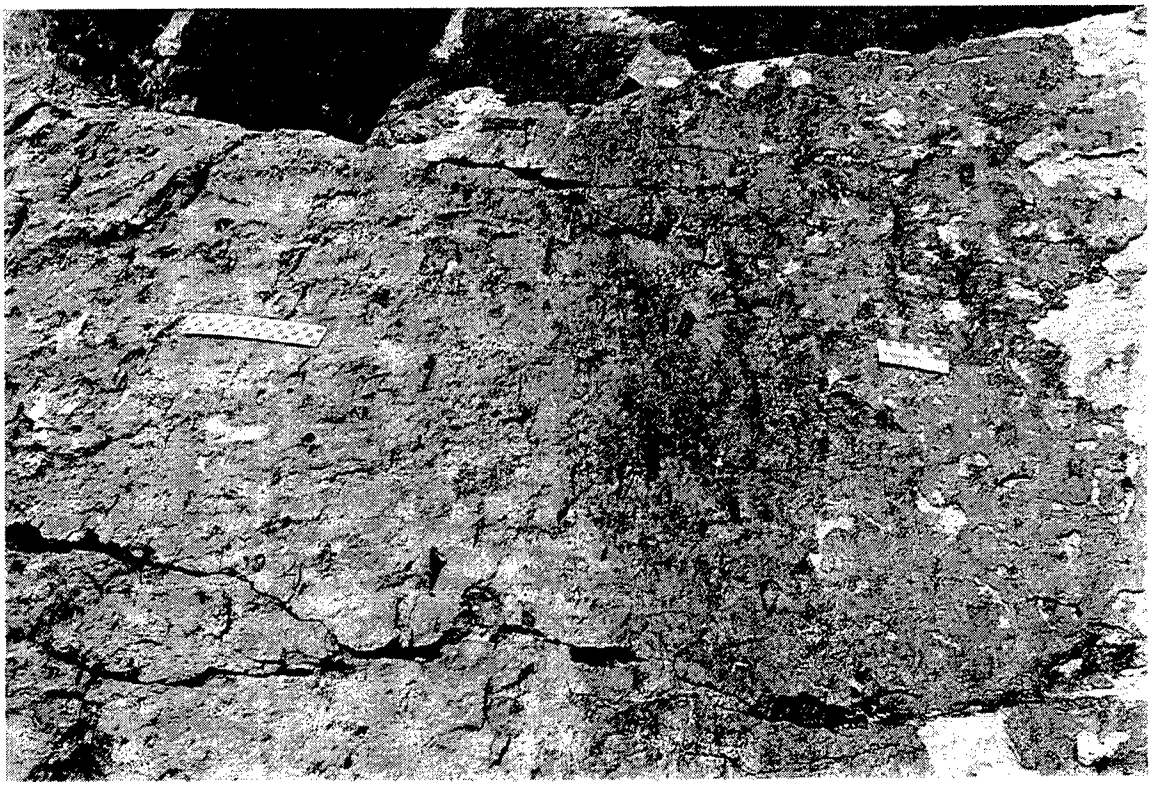


Petroglyph Panel P, Civet Cat Canyon site (26NY369).



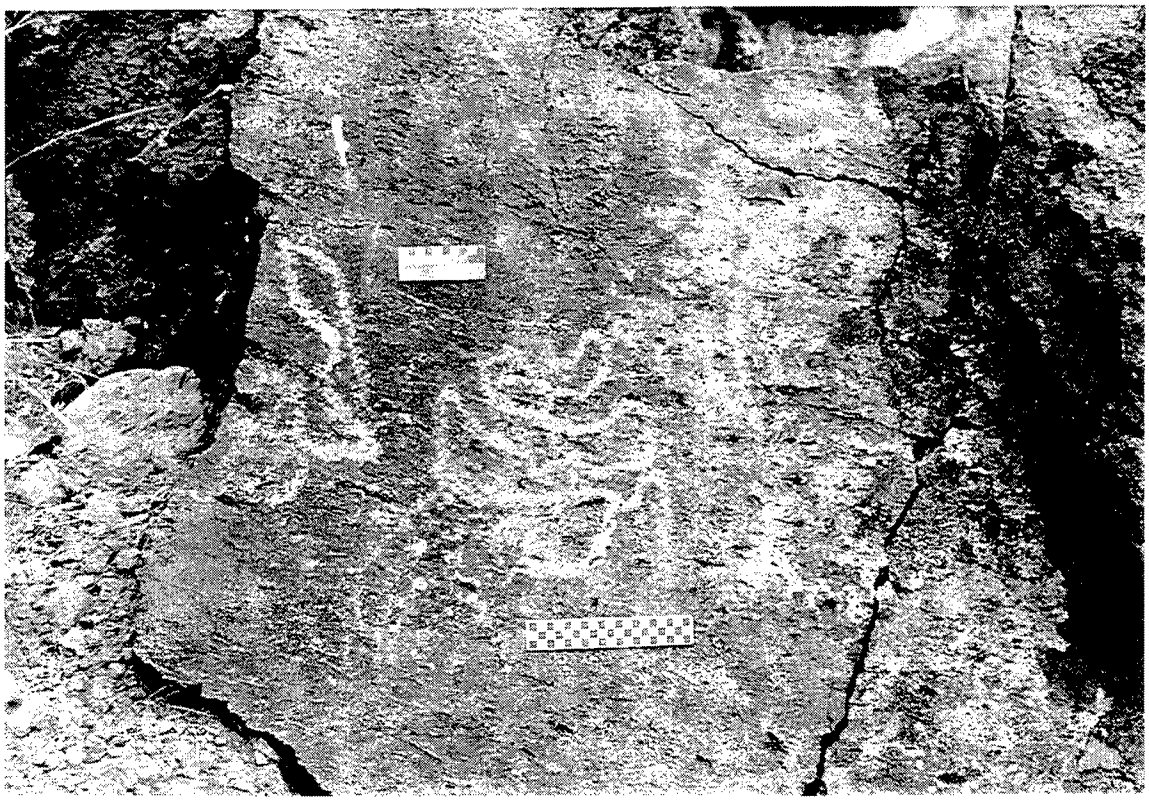
Historic Feature 1, livestock corral and chute, Civet Cat Canyon site (26NY369).

AIRFIELD CANYON

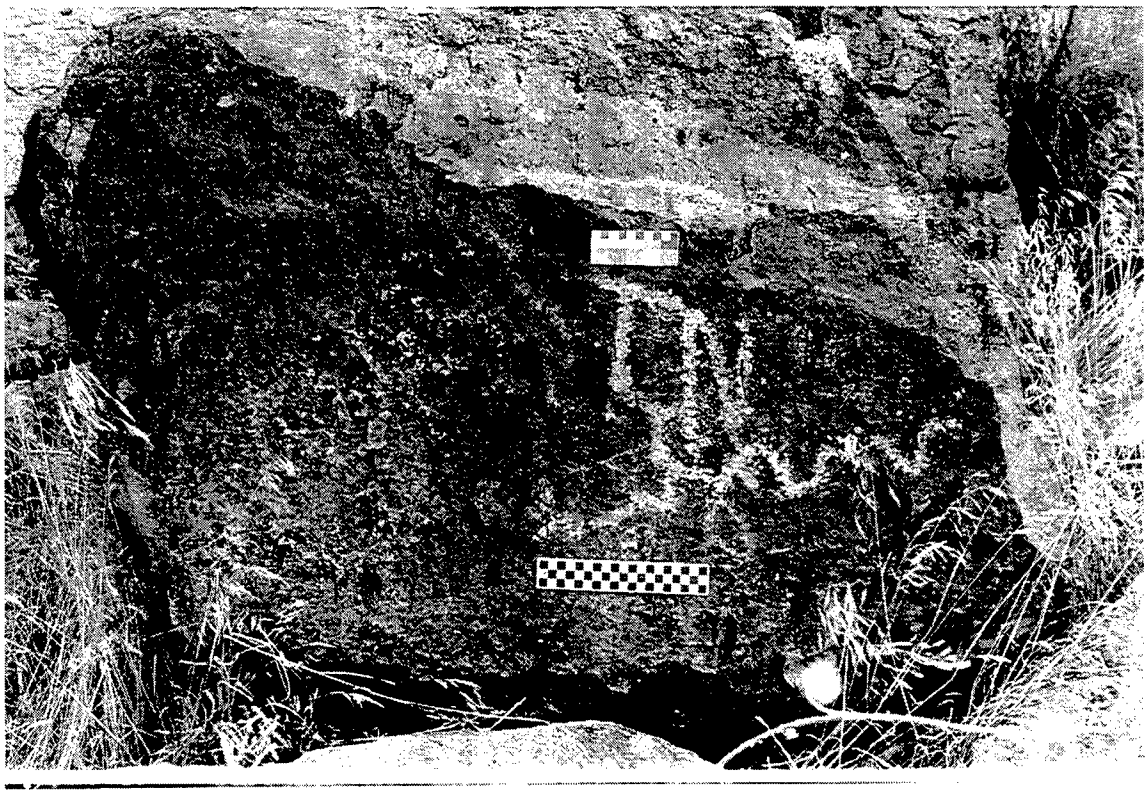


Petroglyph Panel A, Airfield Canyon (26NY2252).

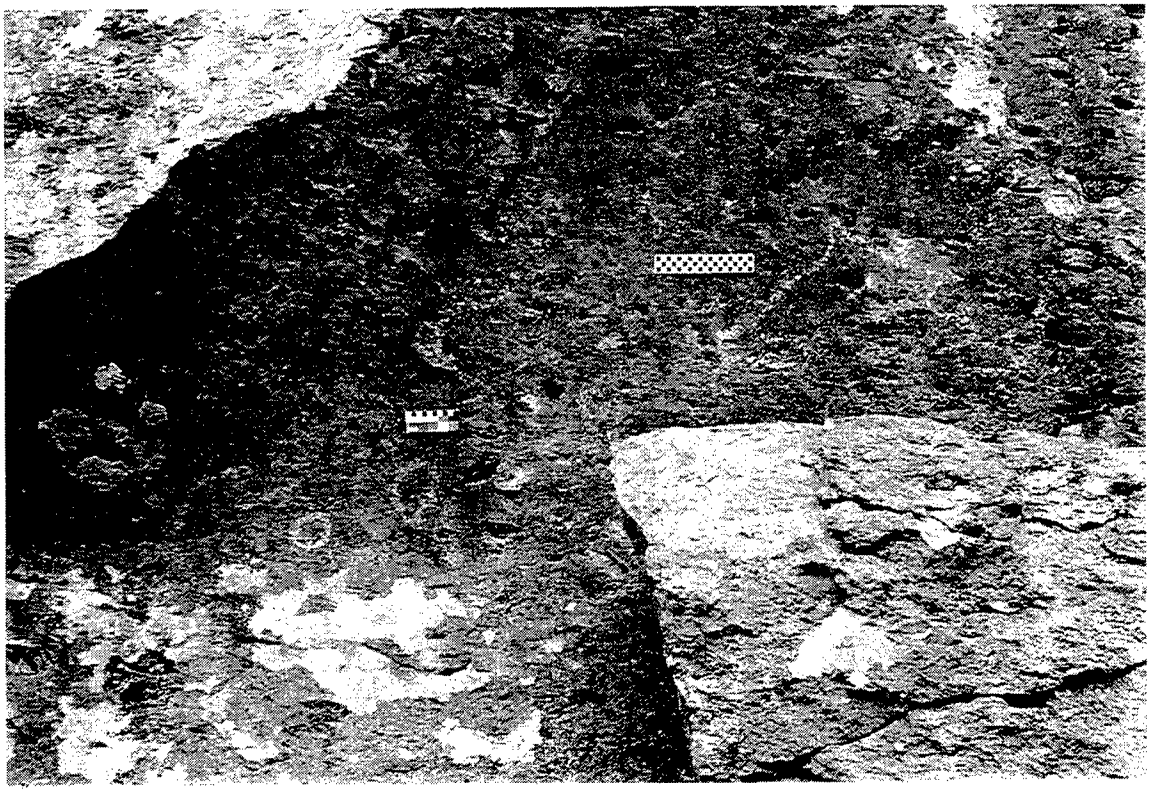
Petroglyph Panel B, Airfield Canyon (26NY2252).



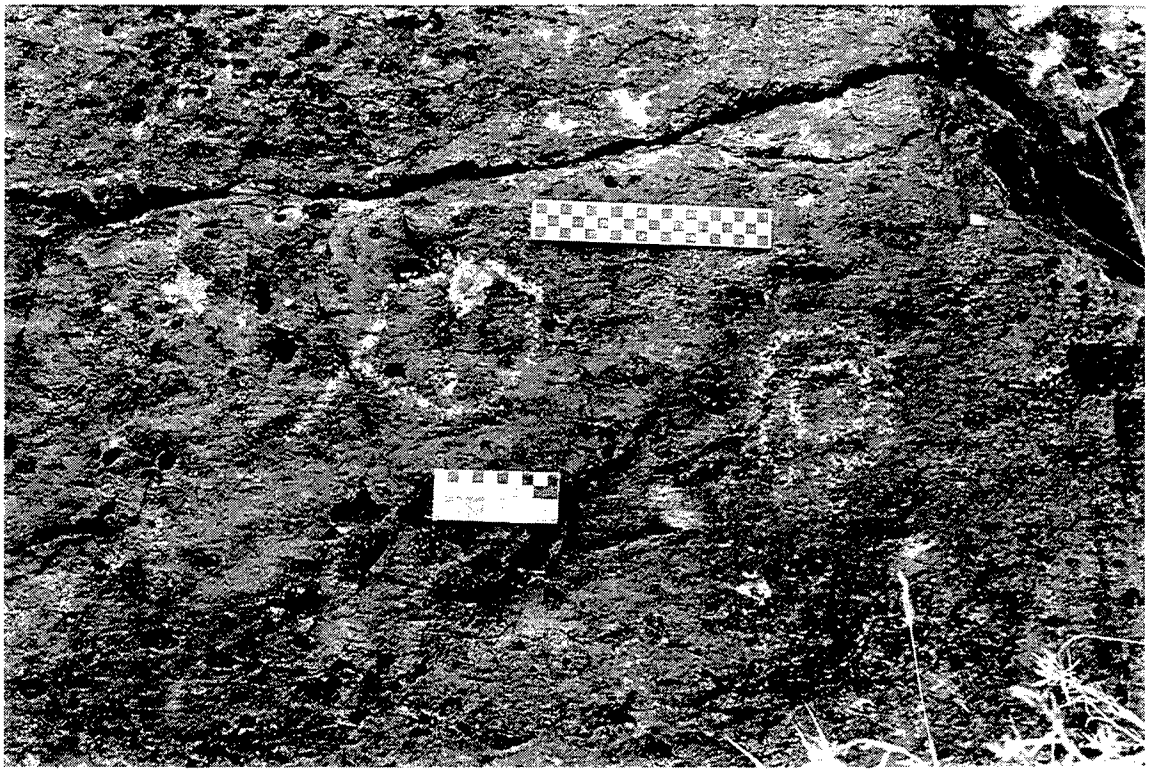
Petroglyph Panel C, Airfield Canyon (26NY2252).



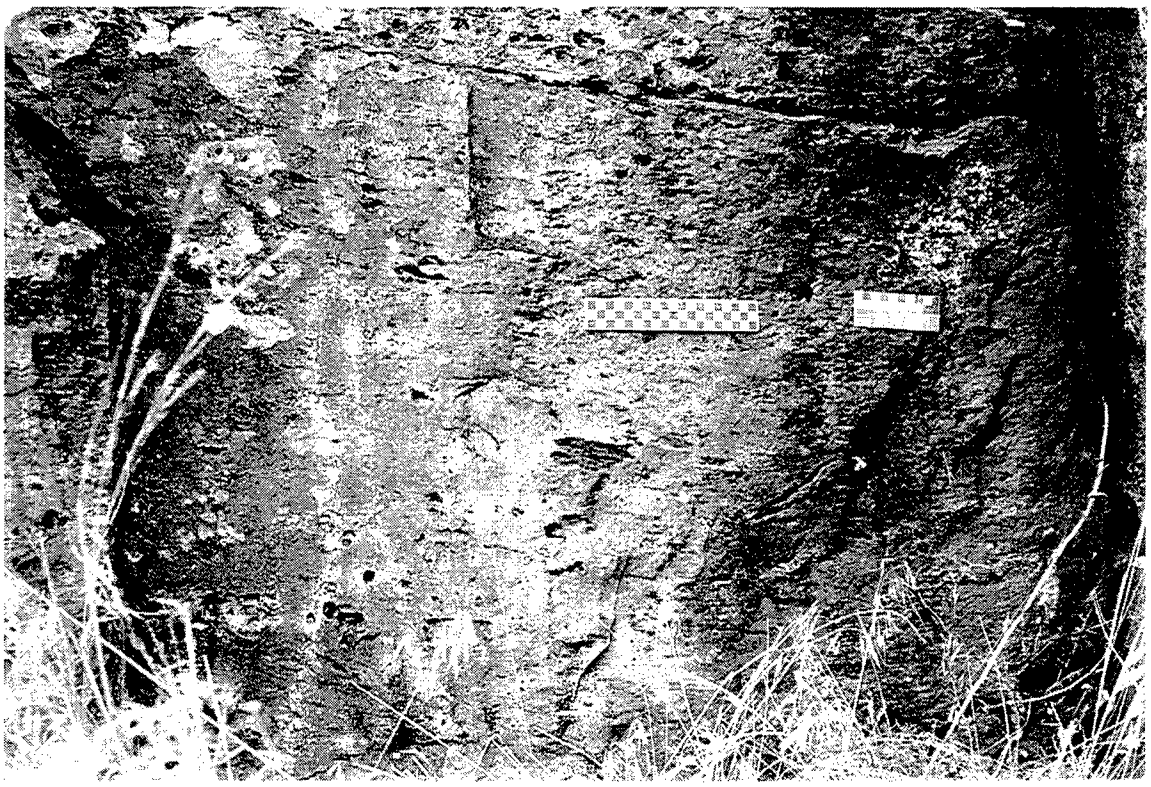
Petroglyph Panel D, Airfield Canyon (26NY2252).



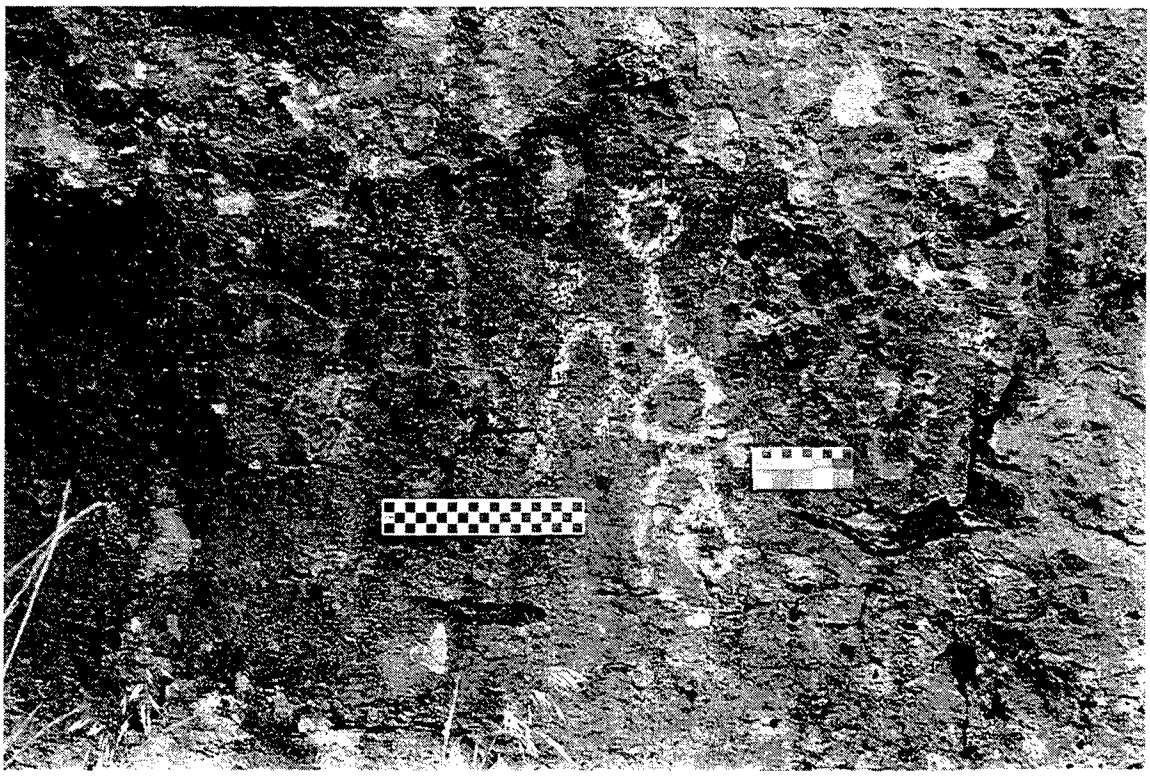
Petroglyph Panel E, Airfield Canyon (26NY2252).



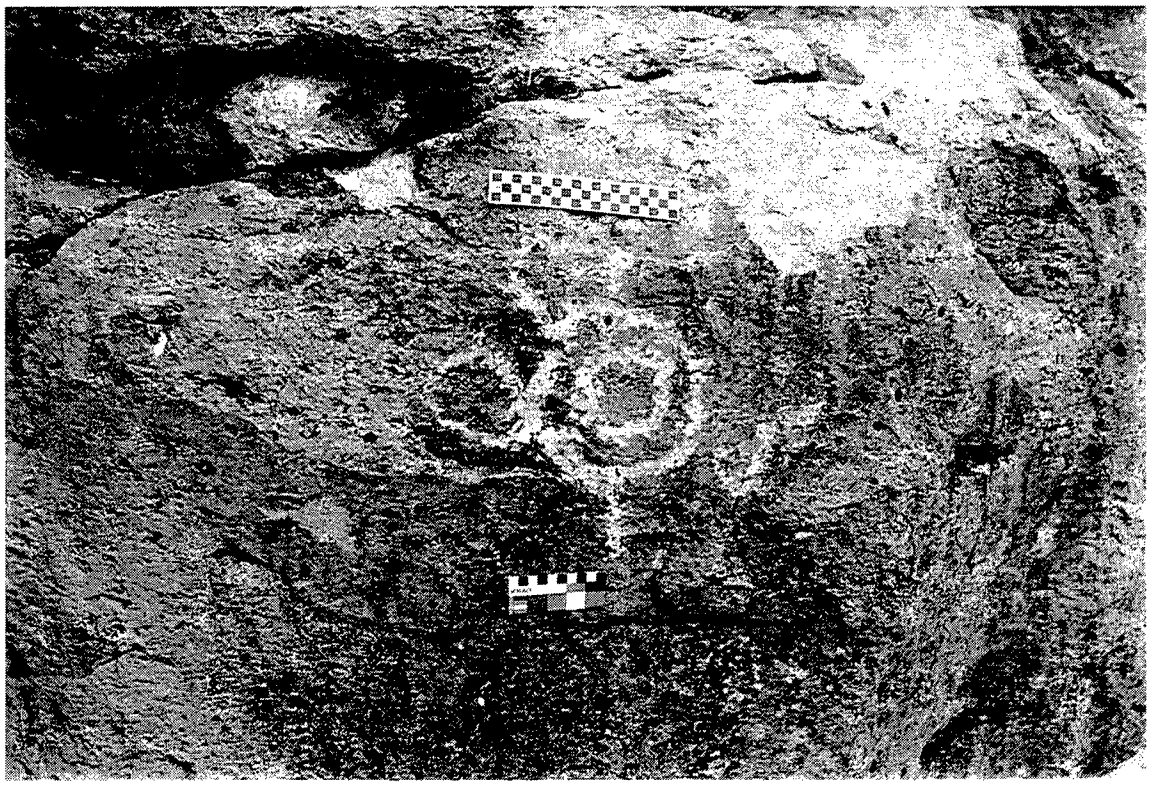
Petroglyph Panel F, Airfield Canyon (26NY2252).



Petroglyph Panel G, Airfield Canyon (26NY2252).



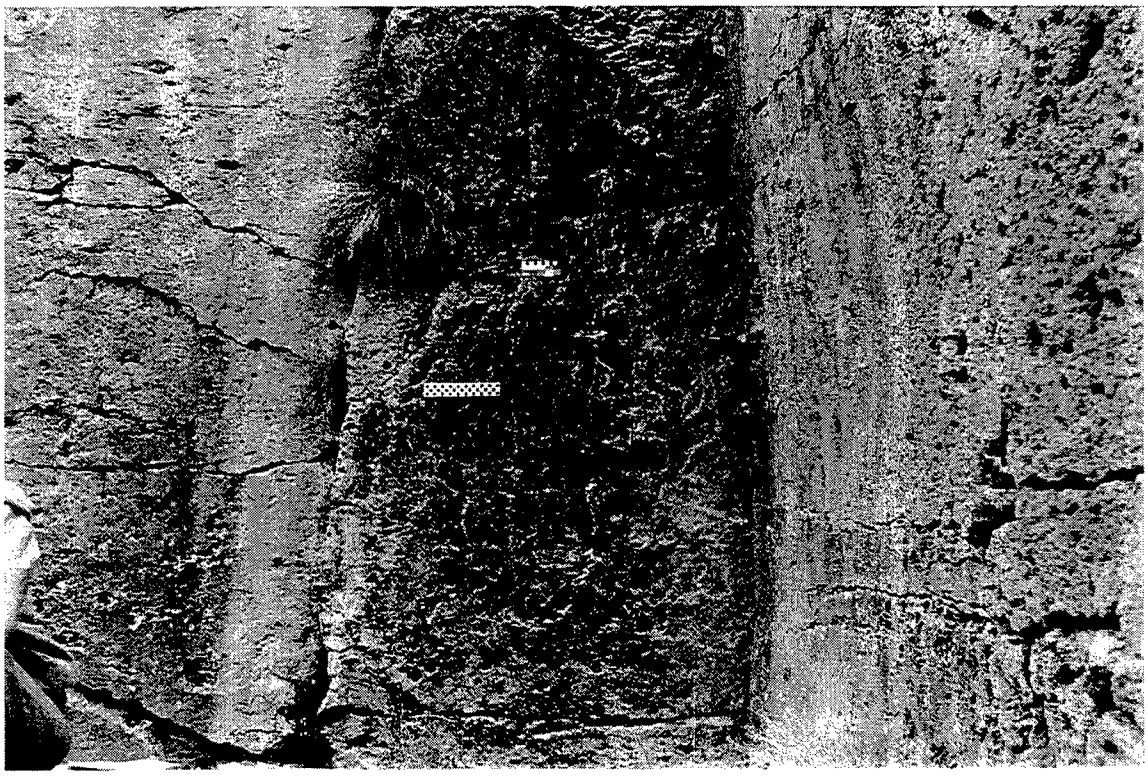
Petroglyph Panel H, Airfield Canyon (26NY2252).



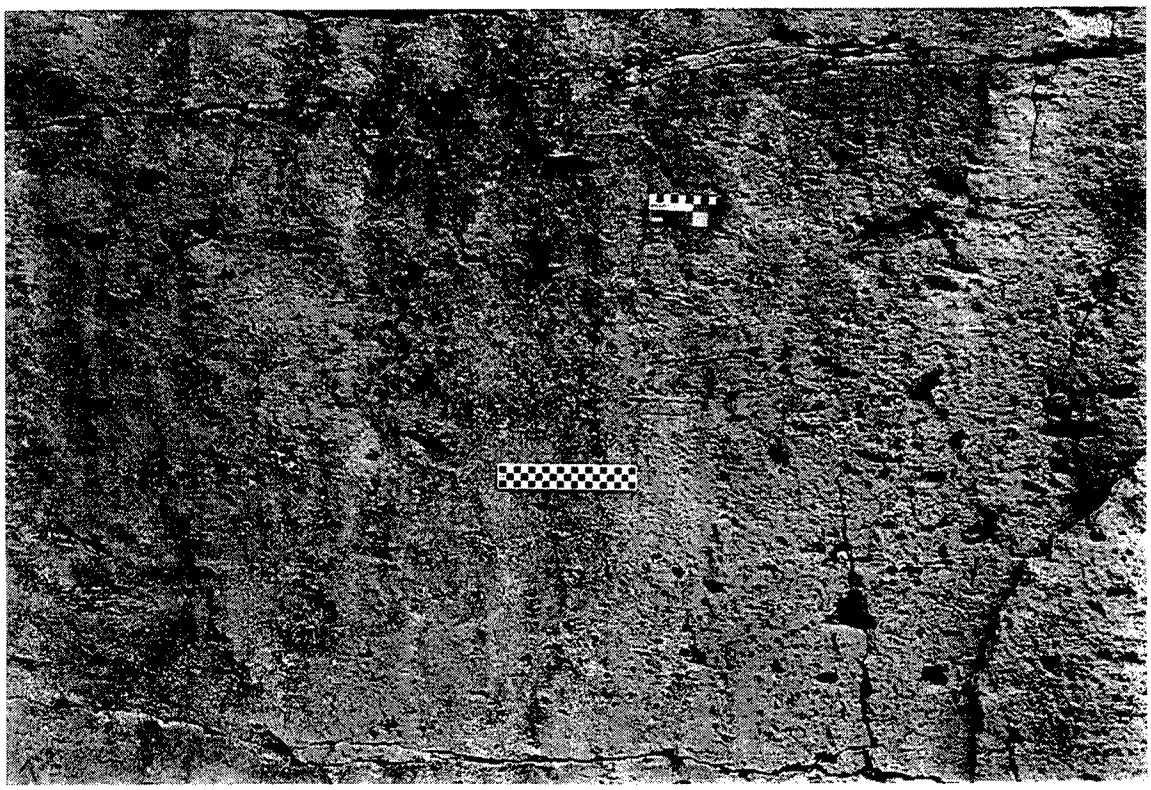
Petroglyph Panel I, Airfield Canyon (26NY2252).

Petroglyph Panel J, Airfield Canyon (26NY2252).

Petroglyph Panel K, Airfield Canyon (26NY2252).

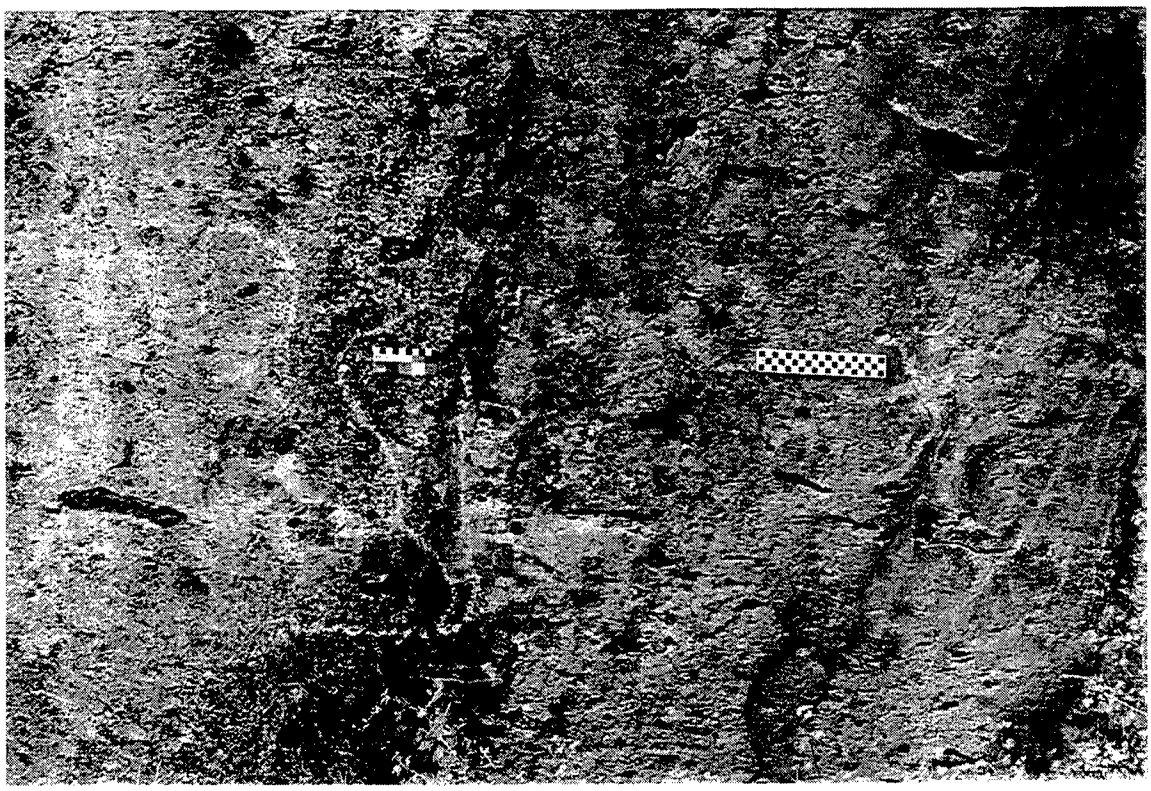


Petroglyph Panel L, Airfield Canyon (26NY2252).

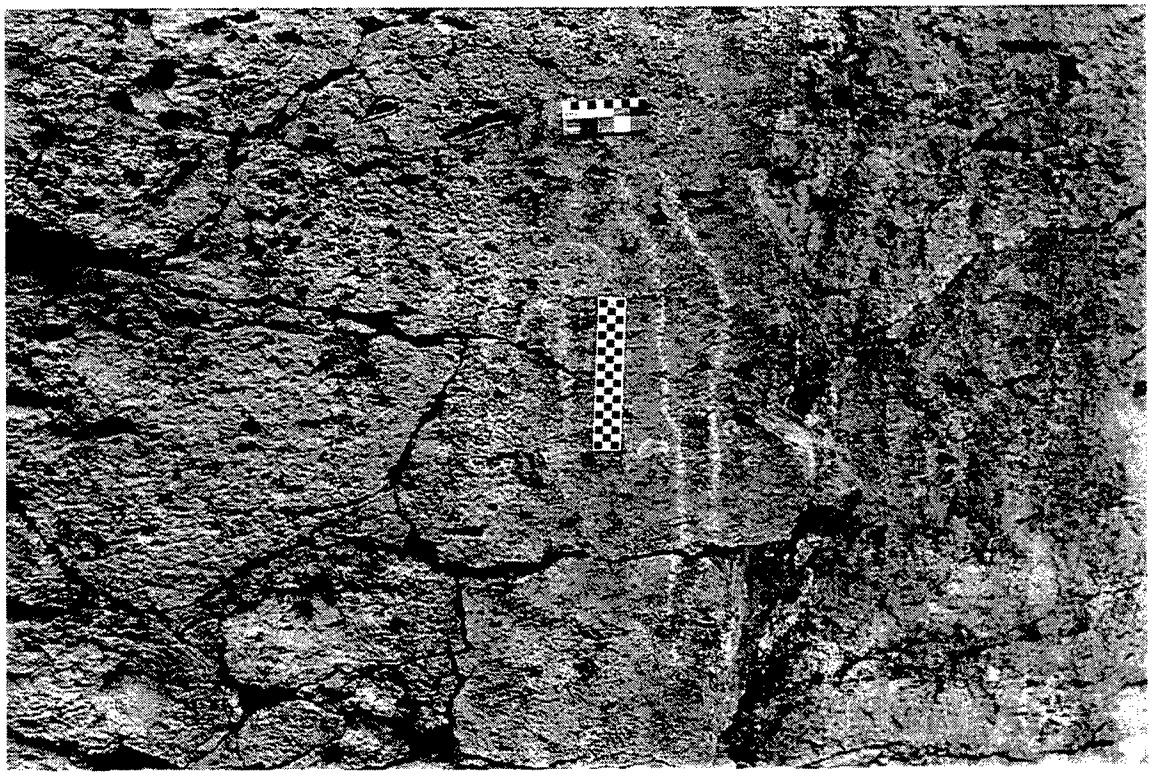


Petroglyph Panel M, Airfield Canyon (26NY2252).

Petroglyph Panel N, Airfield Canyon (26NY2252).

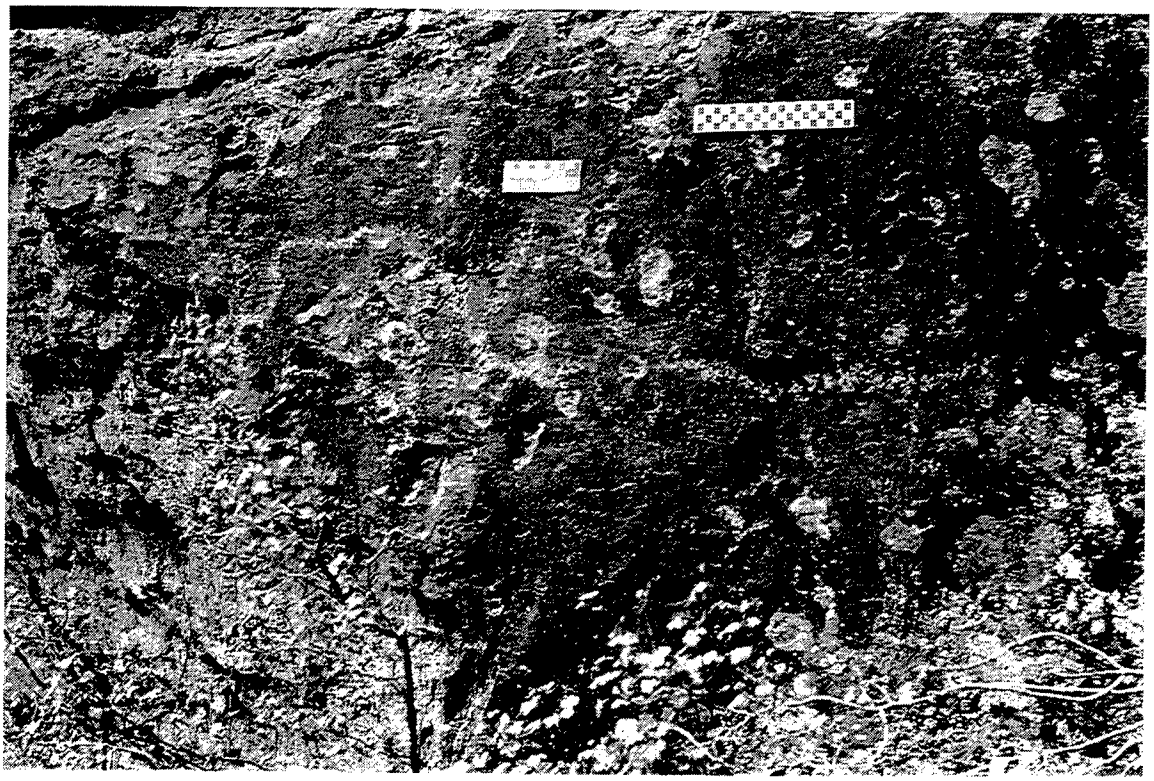


Petroglyph Panel O, Airfield Canyon (26NY2252).

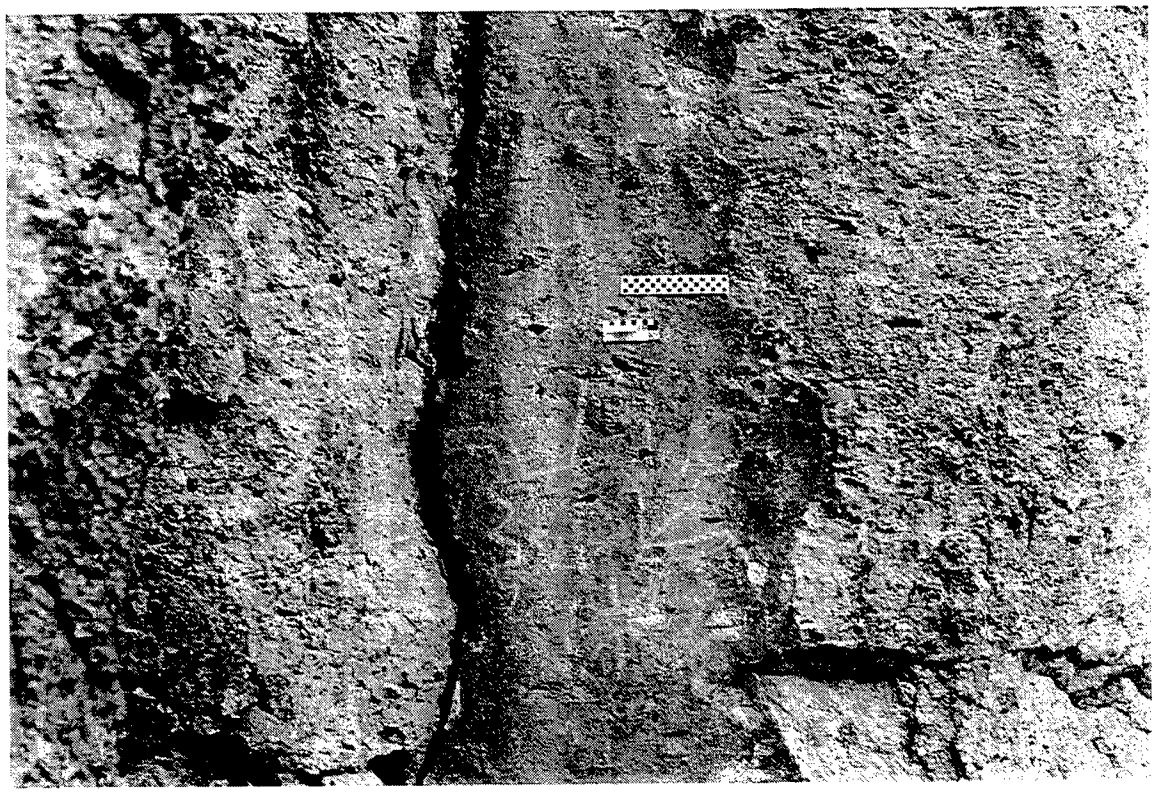


Petroglyph Panel P, Airfield Canyon (26NY2252).

Petroglyph Panel Q, Airfield Canyon (26NY2252).

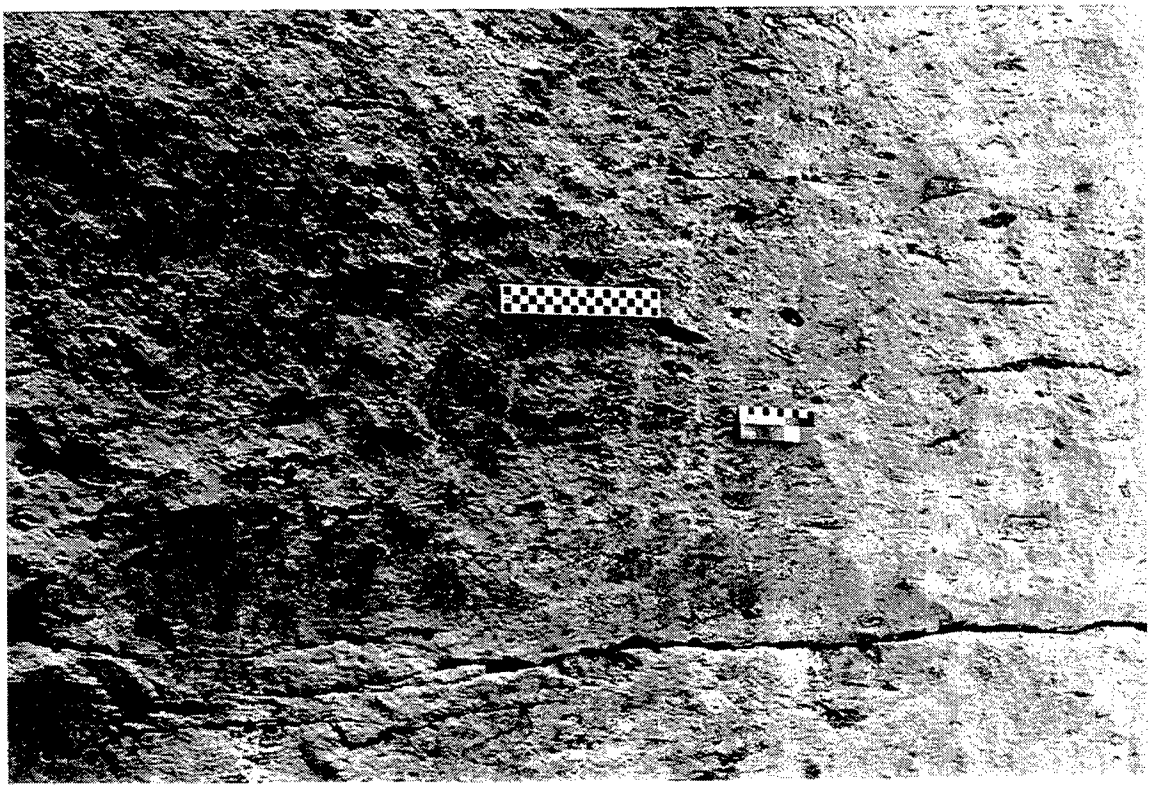


Petroglyph Panel R, Airfield Canyon (26NY2252).

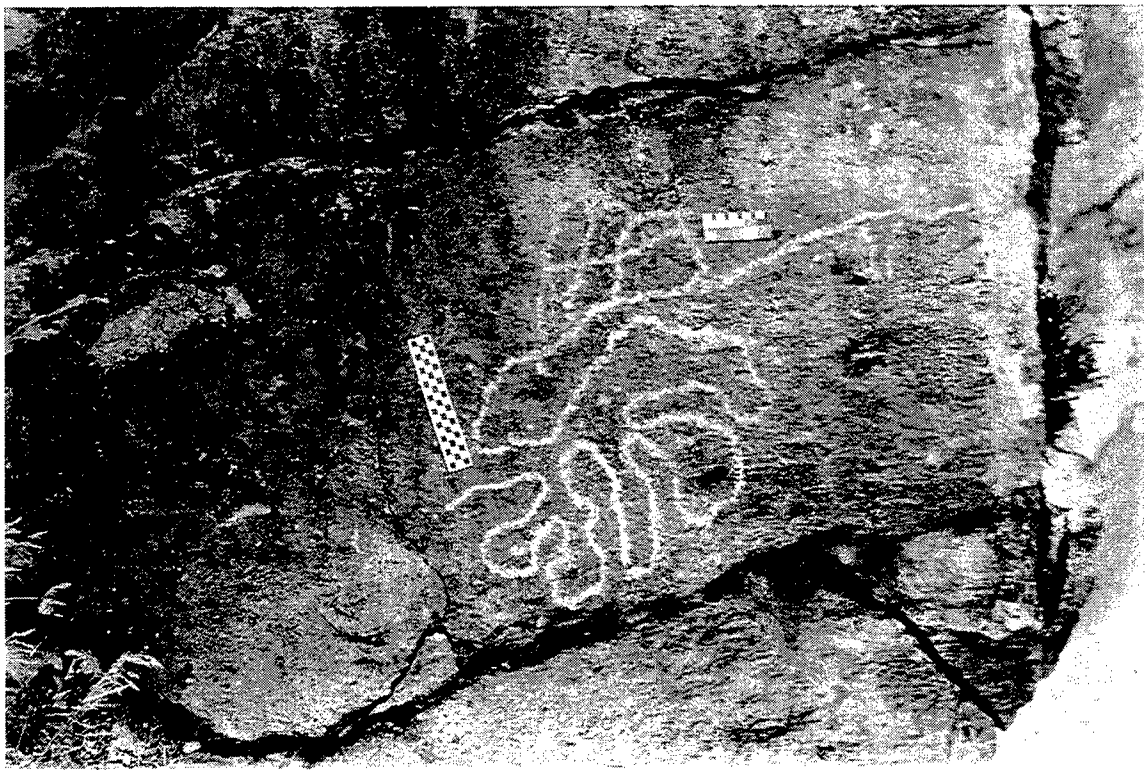


Petroglyph Panel S, Airfield Canyon (26NY2252).

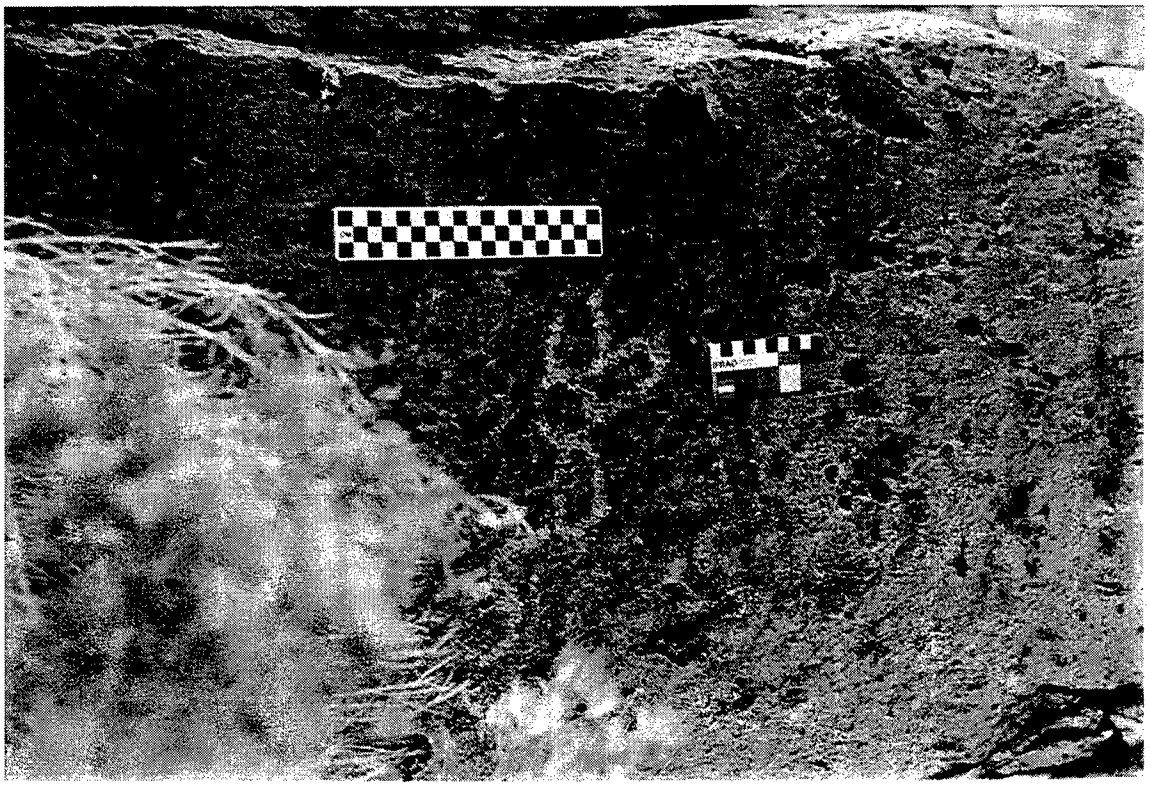
Petroglyph Panel T, Airfield Canyon (26NY2252).



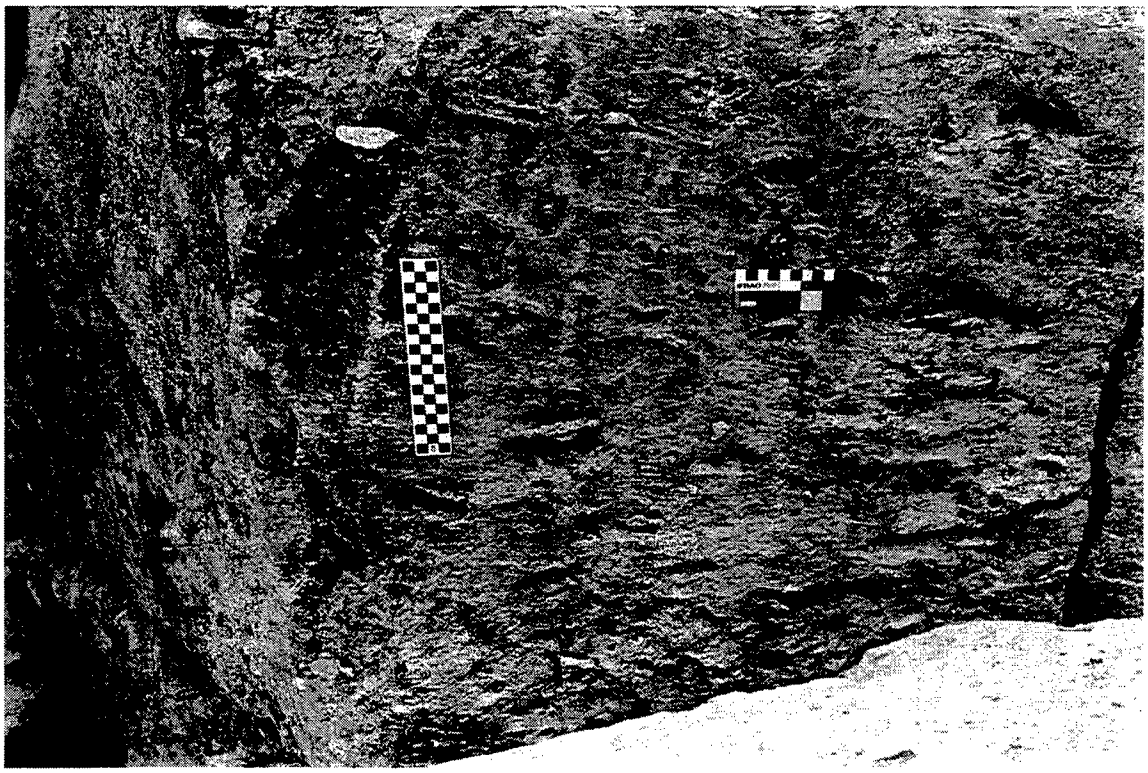
Petroglyph Panel U, Airfield Canyon (26NY2252).



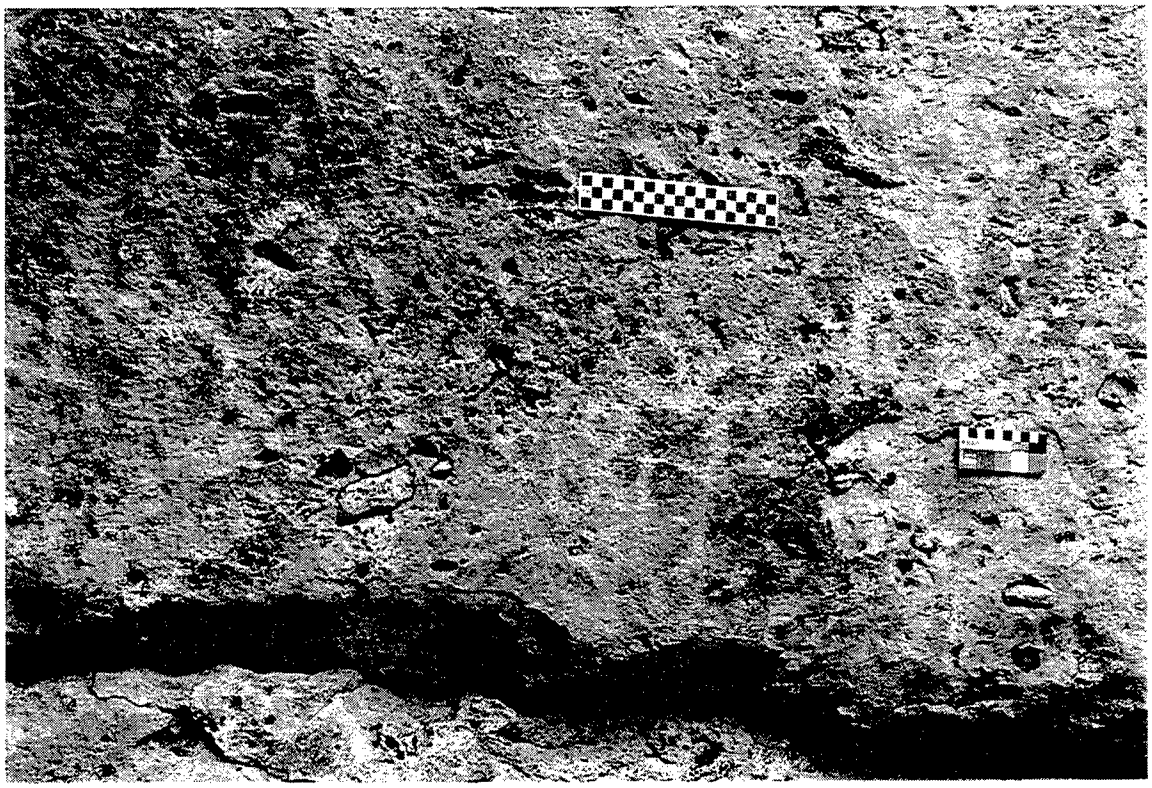
Petroglyph Panel V, Airfield Canyon (26NY2252).



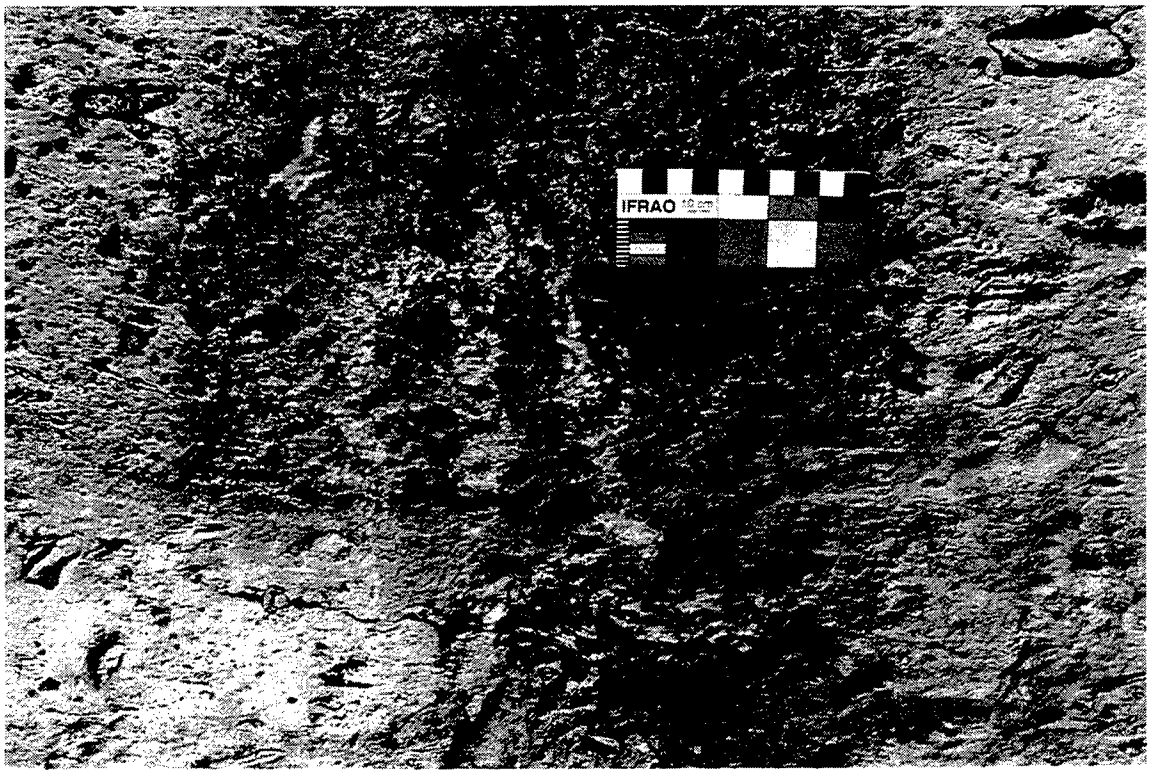
Petroglyph Panel W, Airfield Canyon (26NY2252).



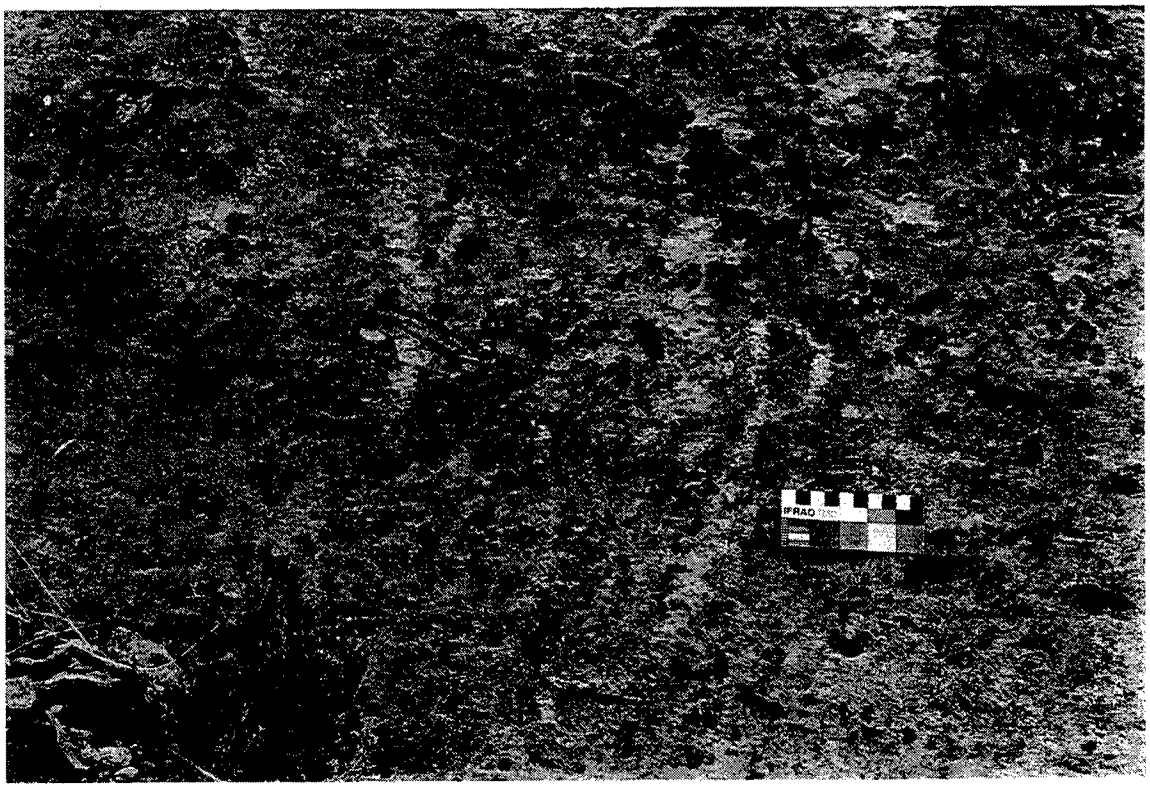
Petroglyph Panel X, Airfield Canyon (26NY2252).



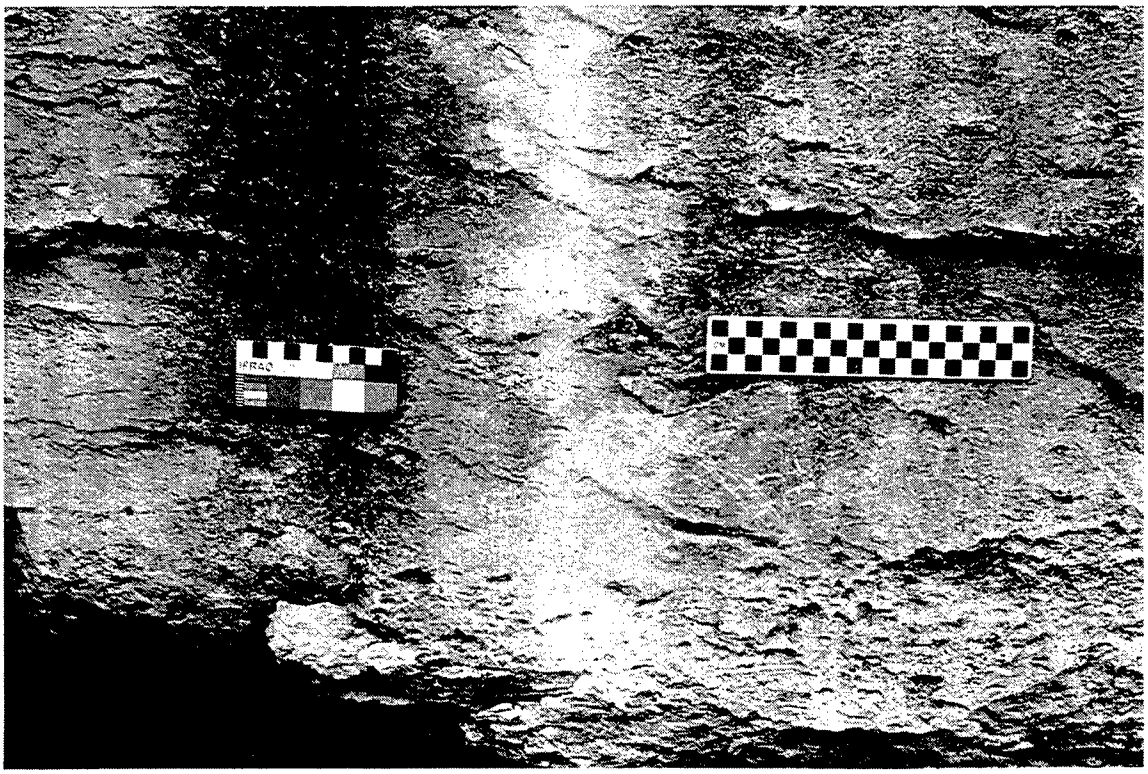
Petroglyph Panel Y, Airfield Canyon (26NY2252).



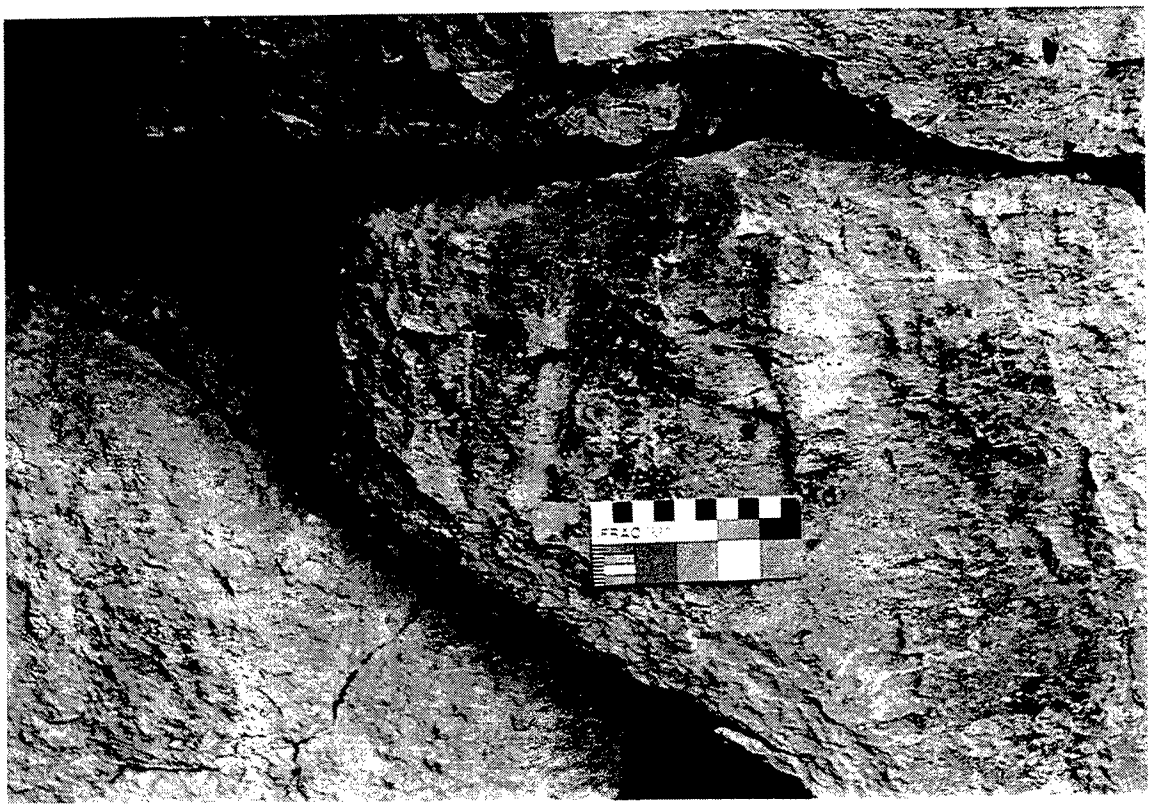
Petroglyph Panel Z, Airfield Canyon (26NY2252).



Petroglyph Panel AA, Airfield Canyon (26NY2252).

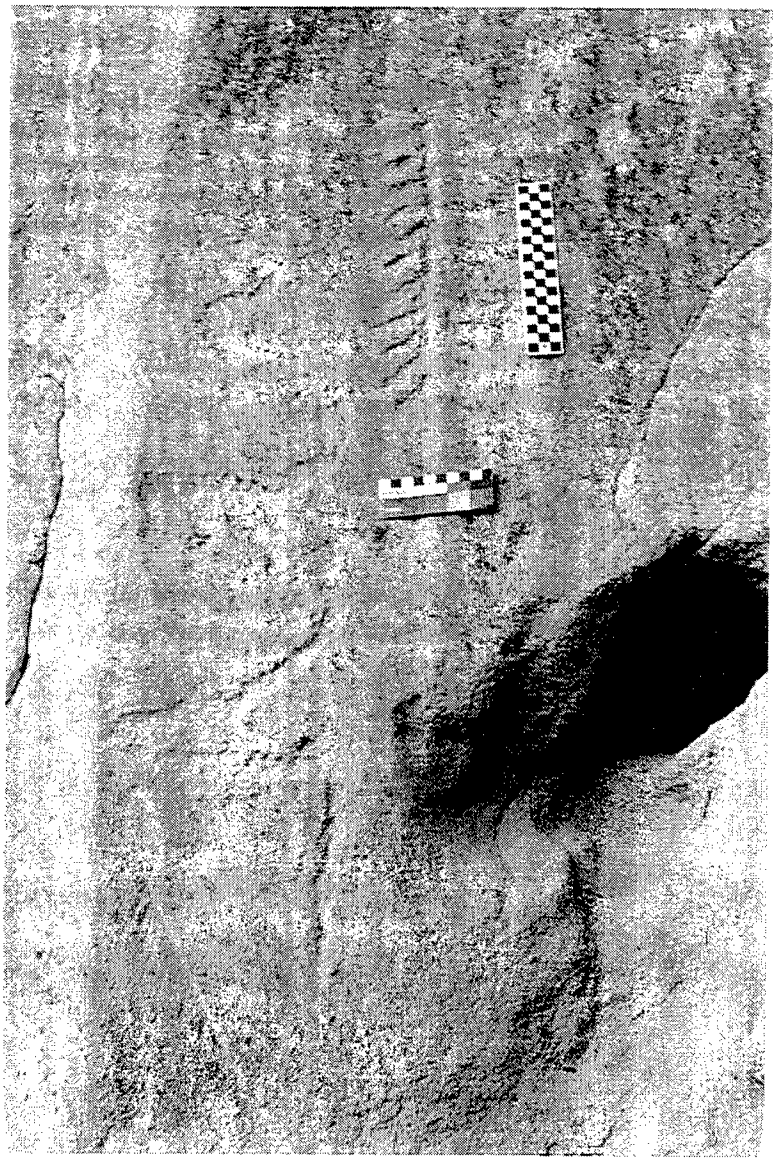


Petroglyph Panel AB, Airfield Canyon (26NY2252).

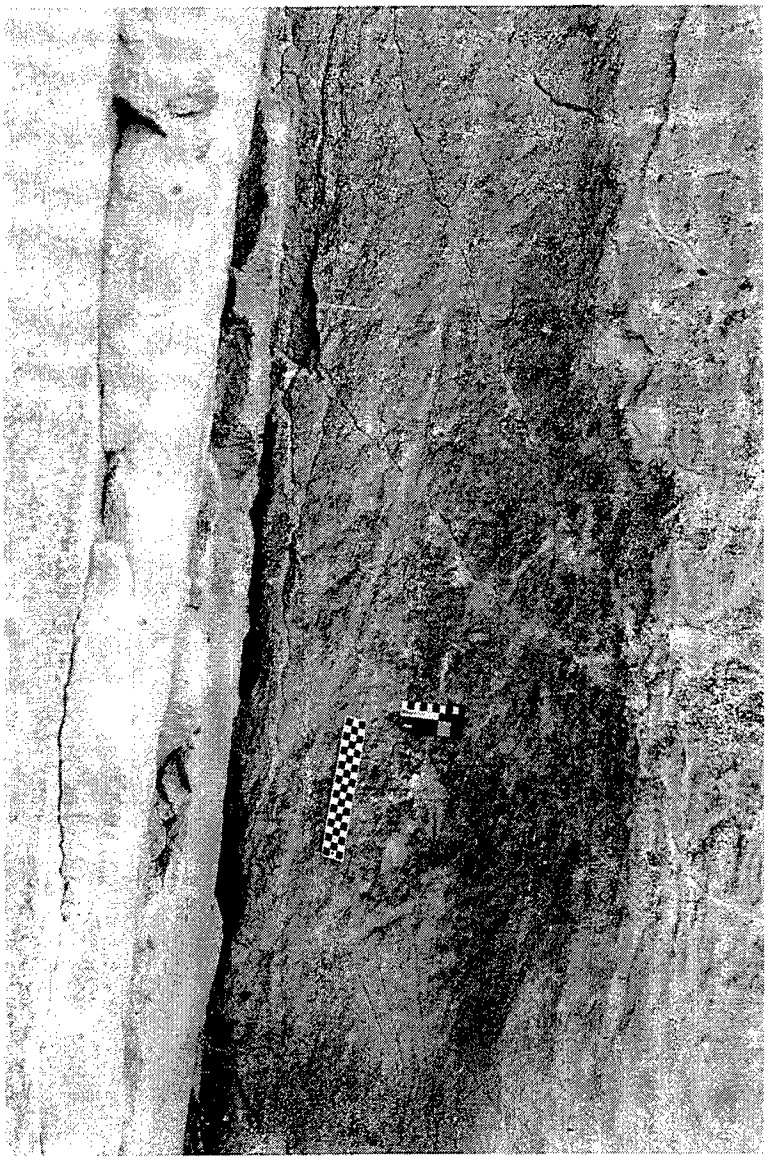


Petroglyph Panel AC, Airfield Canyon (26NY2252).

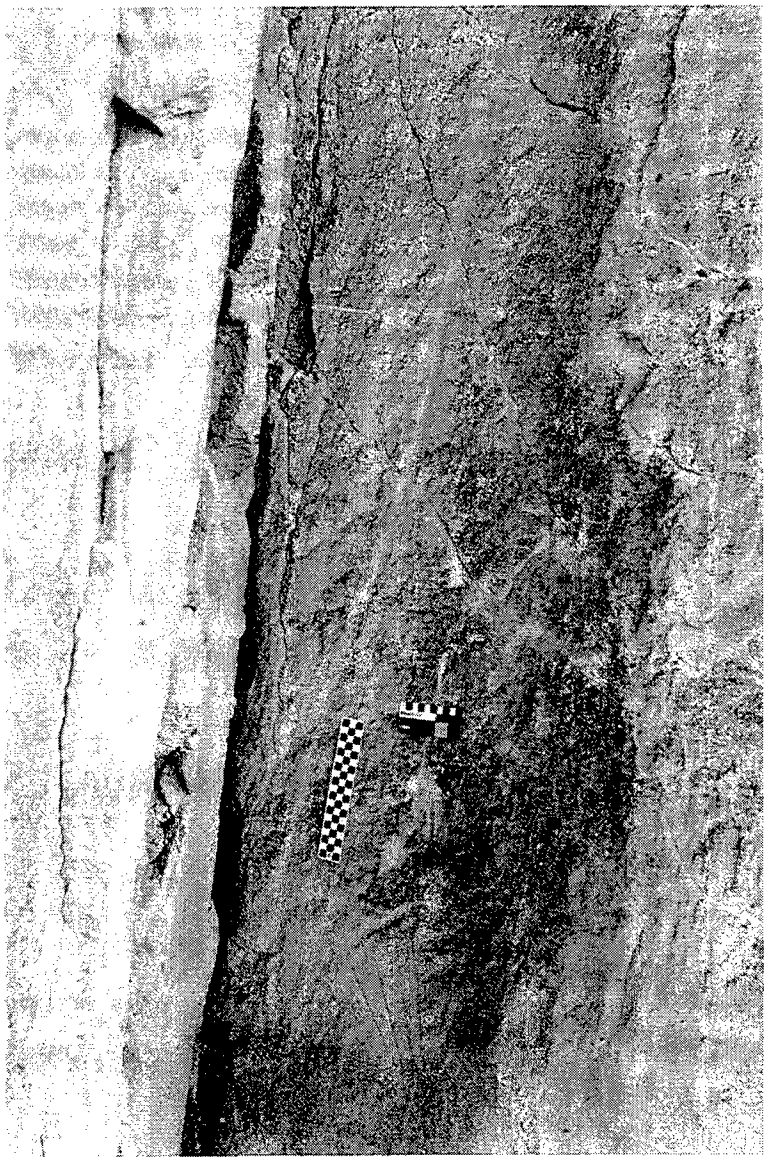
WHITE RIVER NARROWS



Petroglyph Panel A, White River Narrows Locus I (26LN210; BLM 47-110).

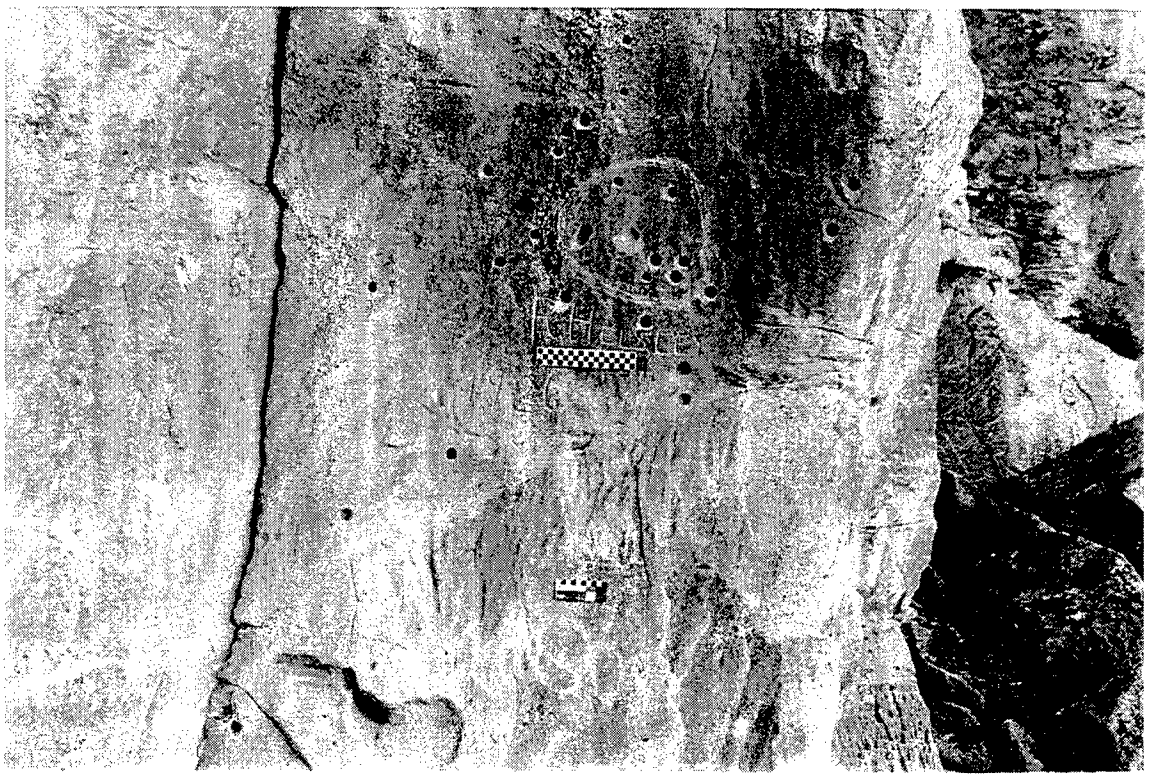


Petroglyph Panel D, White River Narrows Locus I (26LN210; BLM 47-110).



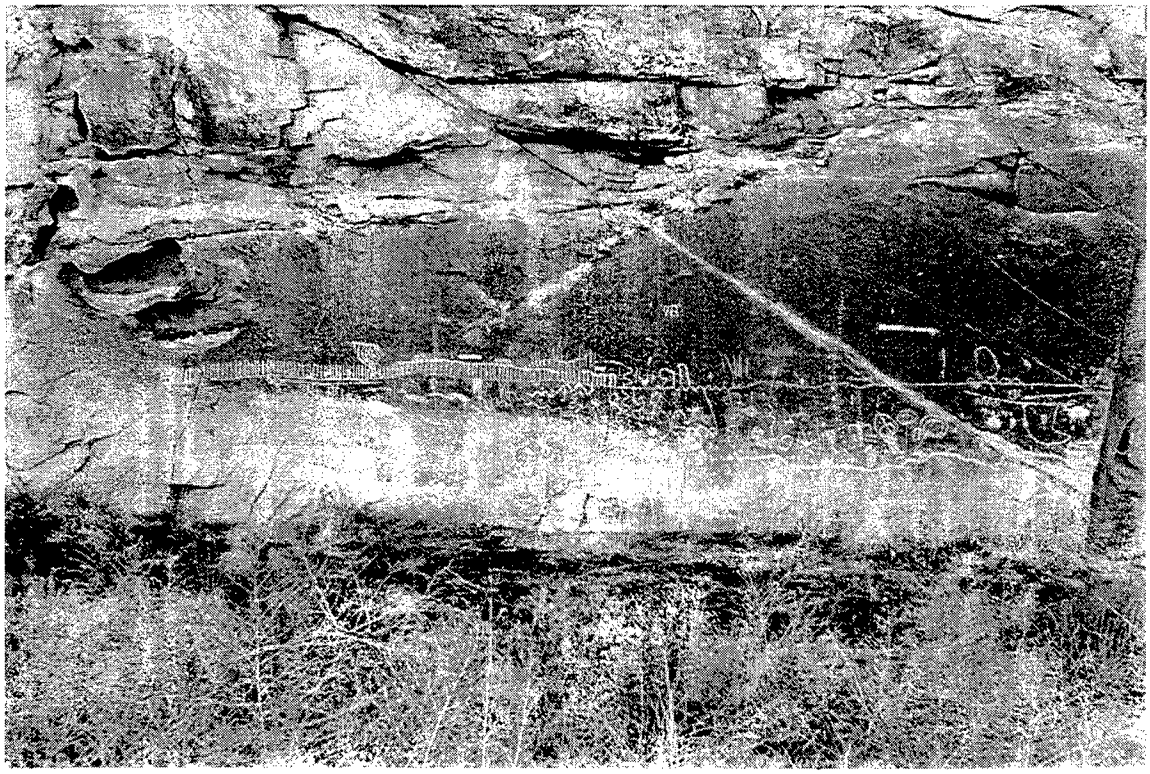
Petroglyph Panel D, White River Narrows Locus I (26LN210; BLM 47-110).

Petroglyph Panel E, White River Narrows Locus I (26LN210; BLM 47-110).

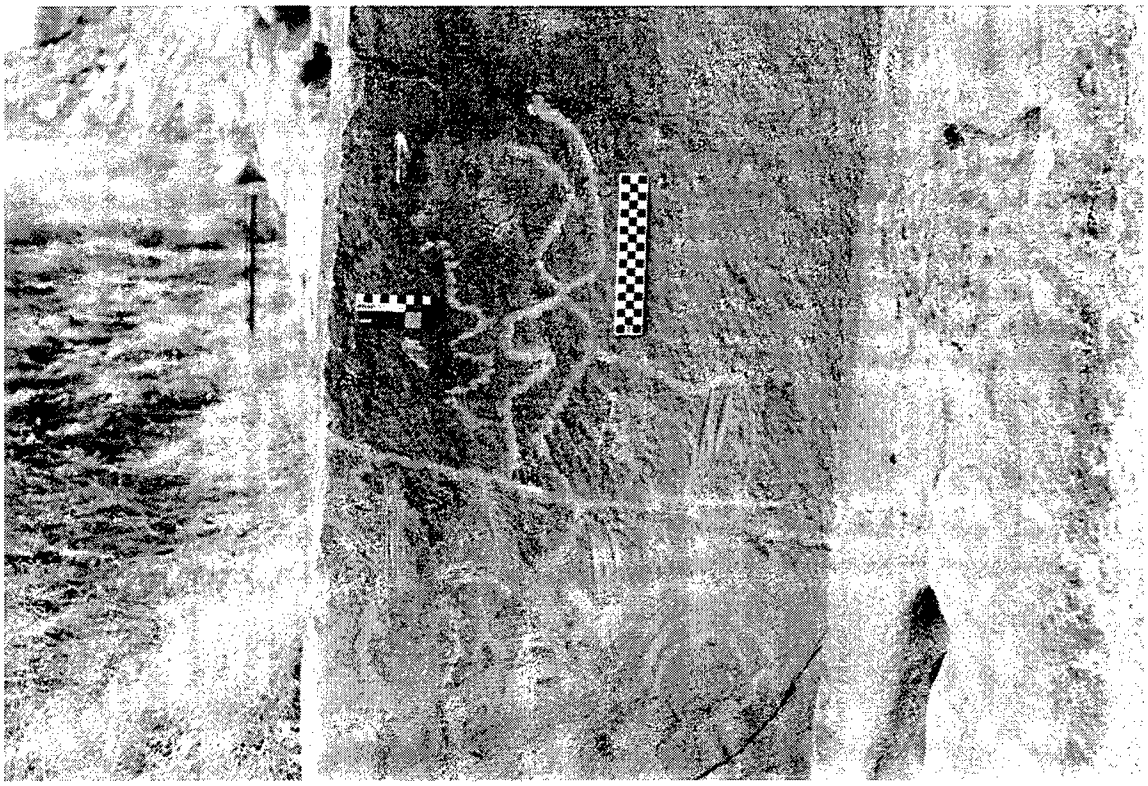


Petroglyph Panel F, White River Narrows Locus I (26LN210; BLM 47-110).

Petroglyph Panel G, White River Narrows Locus I (26LN210; BLM 47-110).

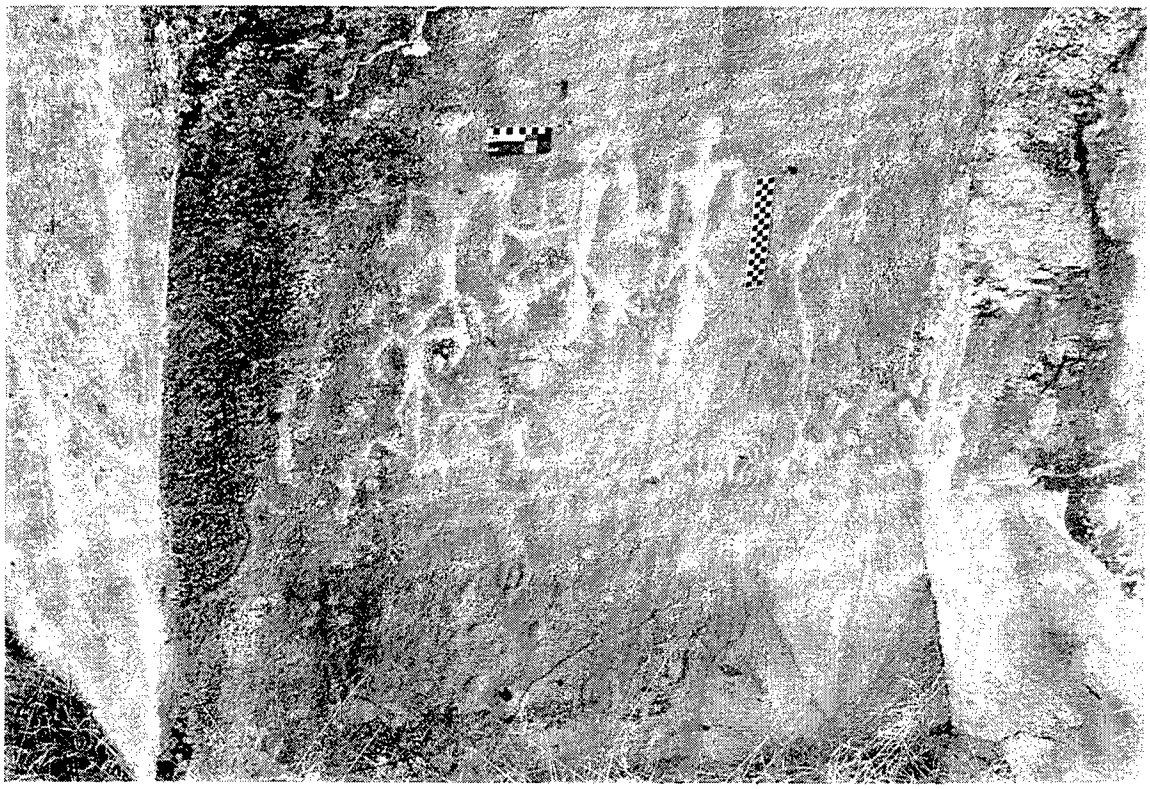


Petroglyph Panel H, White River Narrows Locus I (26LN210; BLM 47-110).



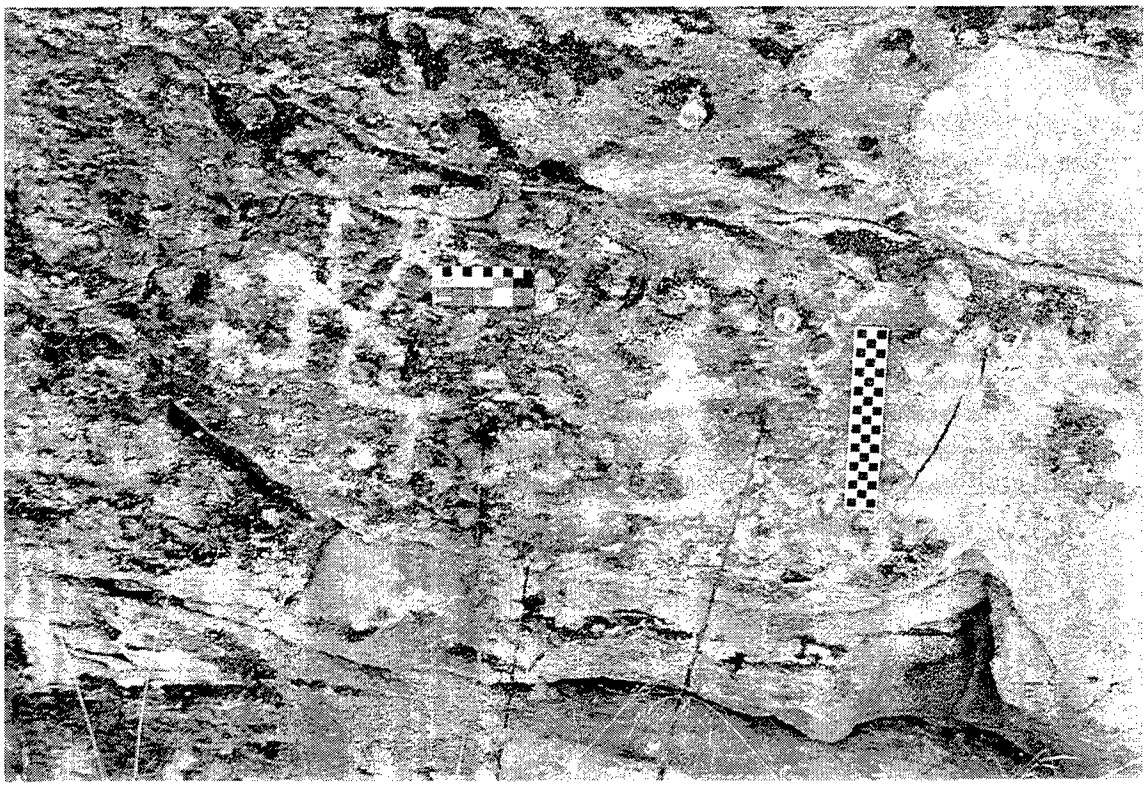
Petroglyph Panel I, White River Narrows Locus I (26LN210; BLM 47-110).

Petroglyph Panel J, White River Narrows Locus I (26LN210; BLM 47-110).

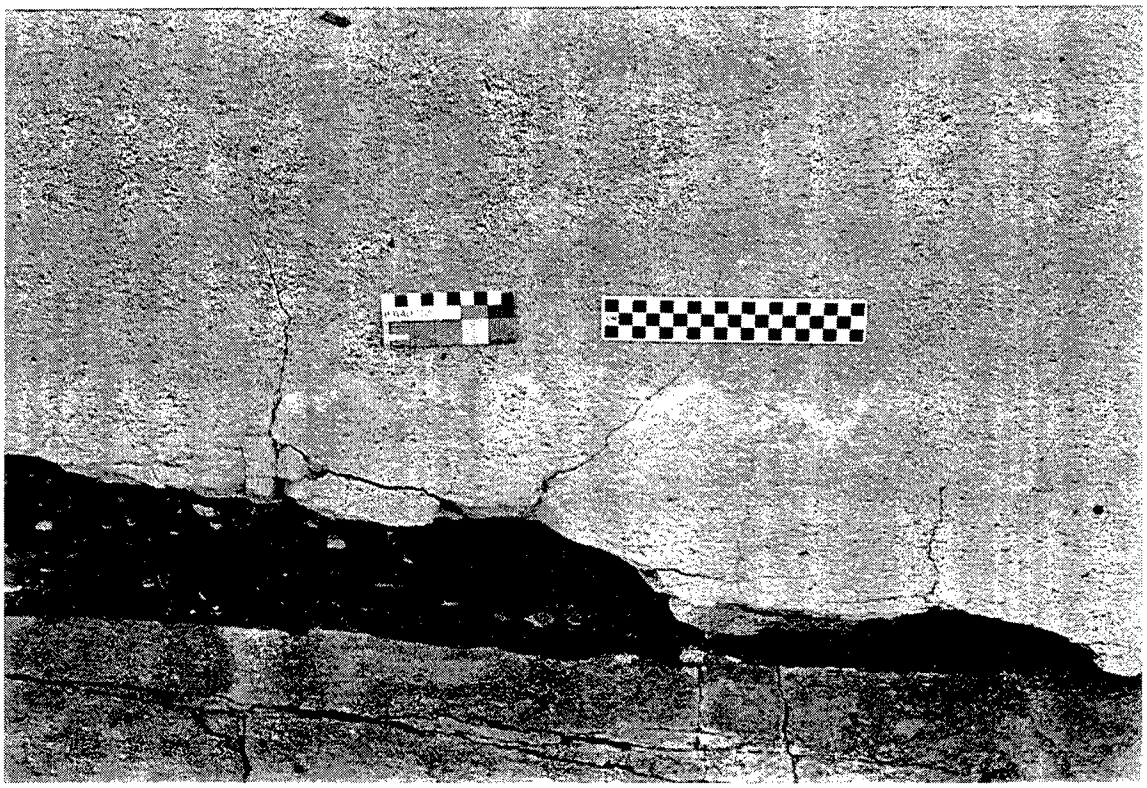


Petroglyph Panel K, White River Narrows Locus I (26LN210; BLM 47-110).

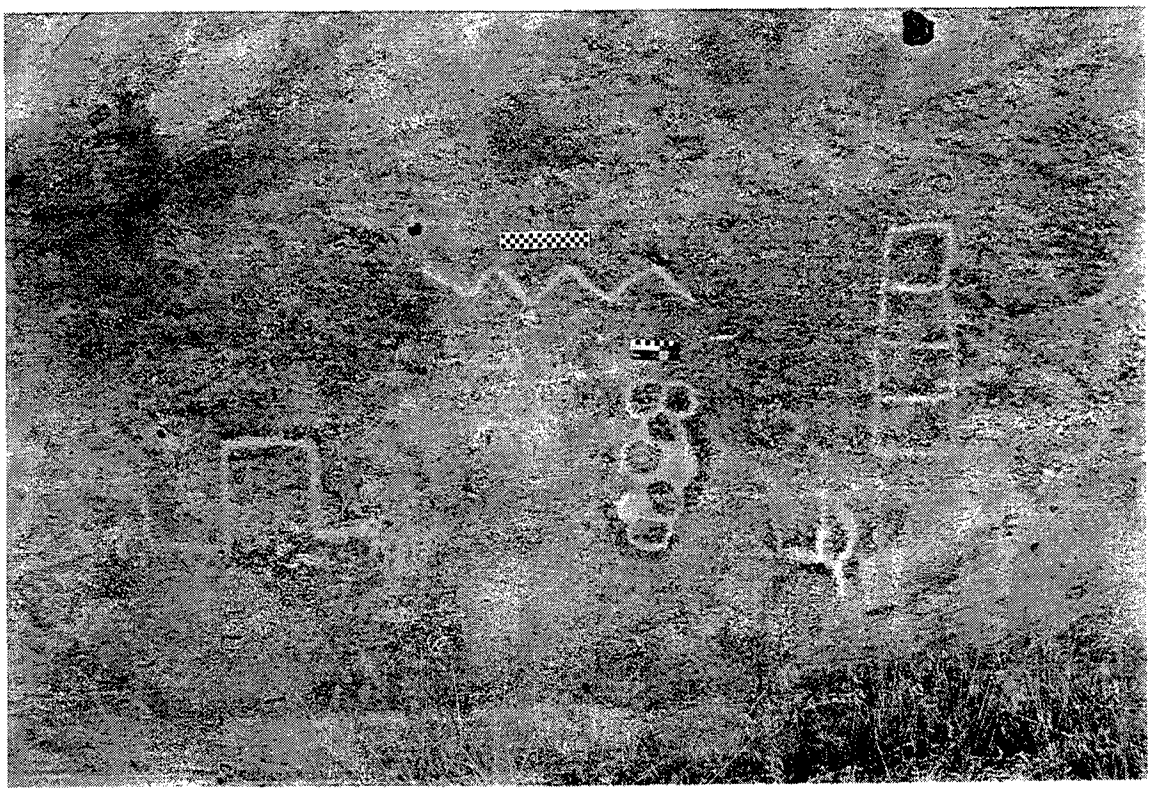
Petroglyph Panel L, White River Narrows Locus I (26LN210; BLM 47-110).



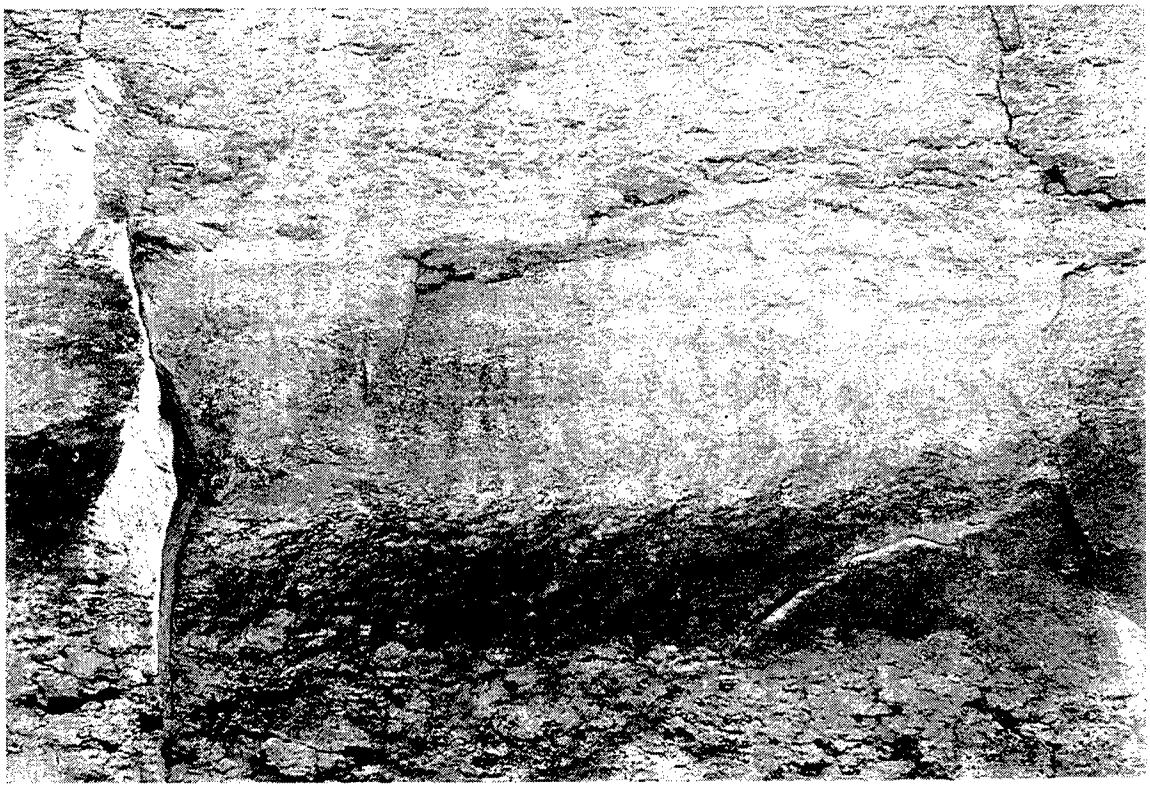
Petroglyph Panel M, White River Narrows Locus I (26LN210; BLM 47-110).



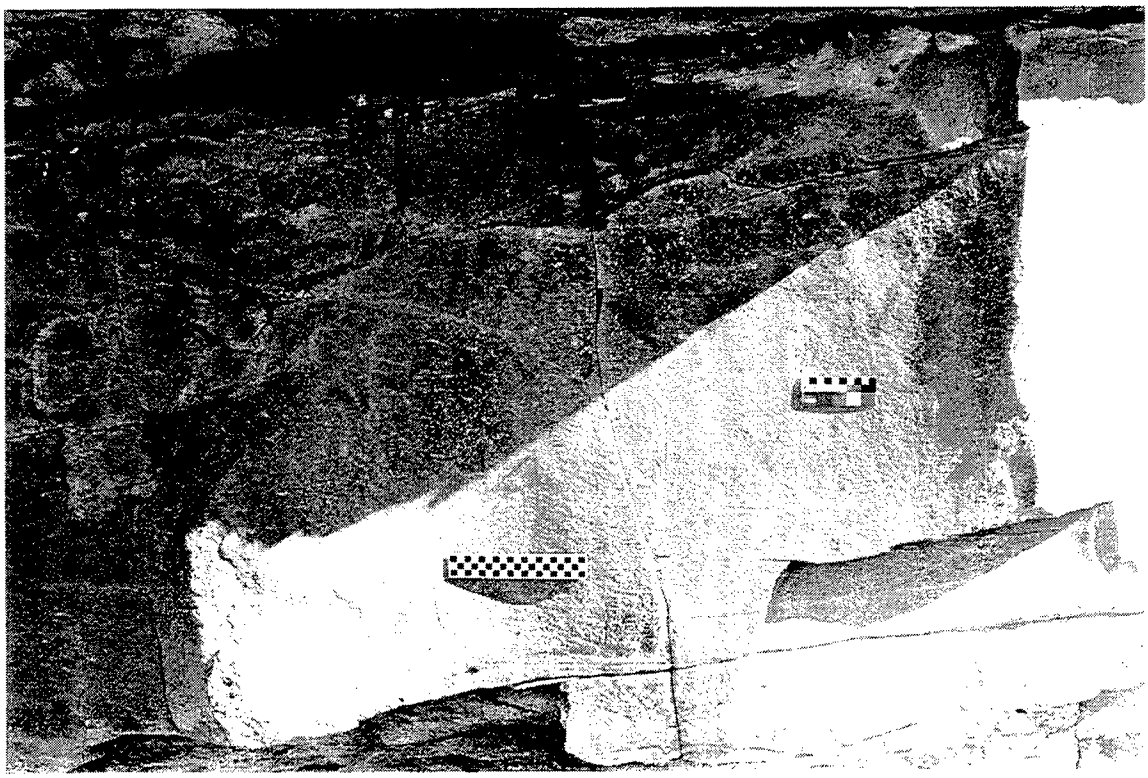
Petroglyph Panel N, White River Narrows Locus I (26LN210; BLM 47-110).



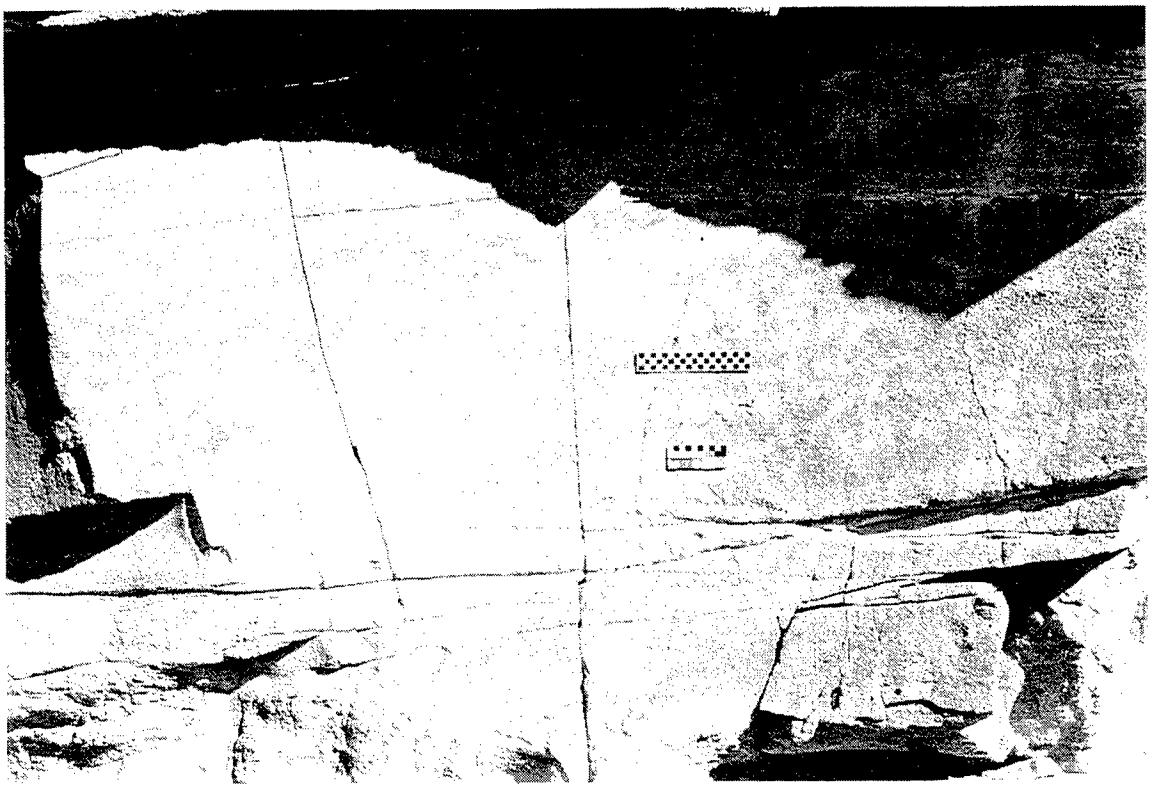
Petroglyph Panel O, White River Narrows Locus I (26LN210; BLM 47-110).



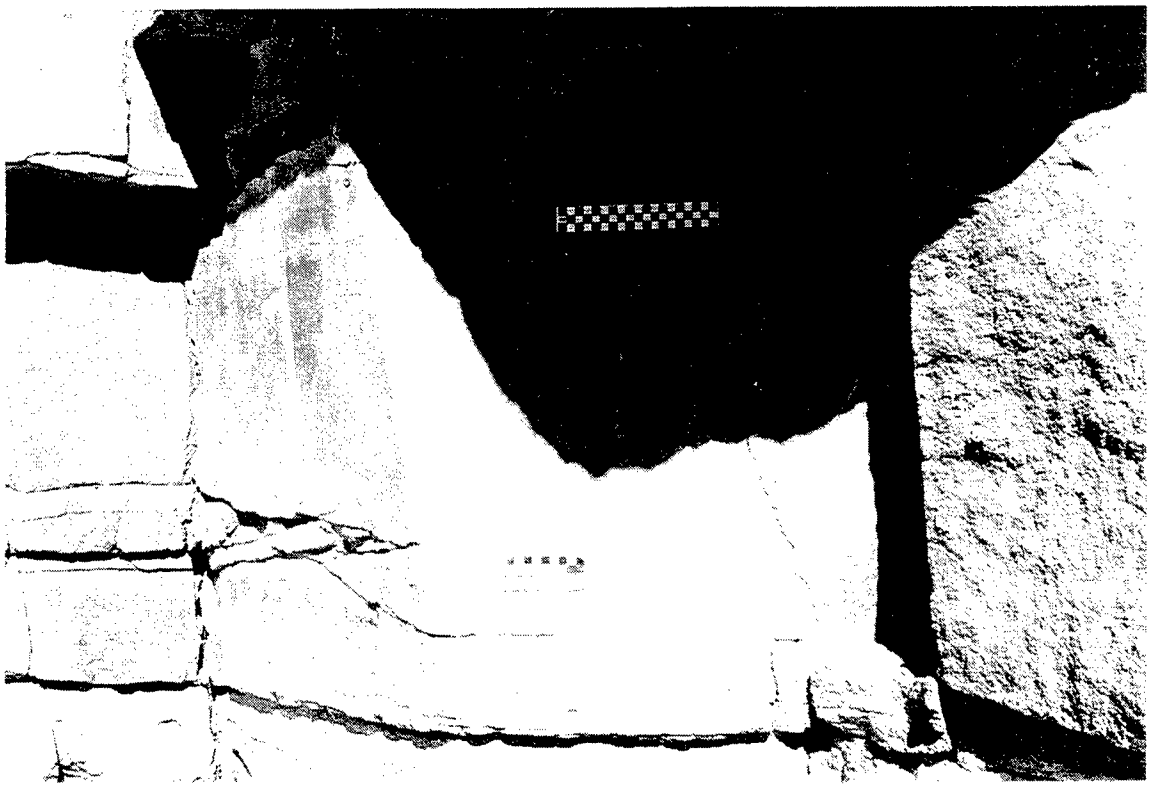
Pictograph Panel A, White River Narrows Locus II (26LN210; BLM 47- 4988).



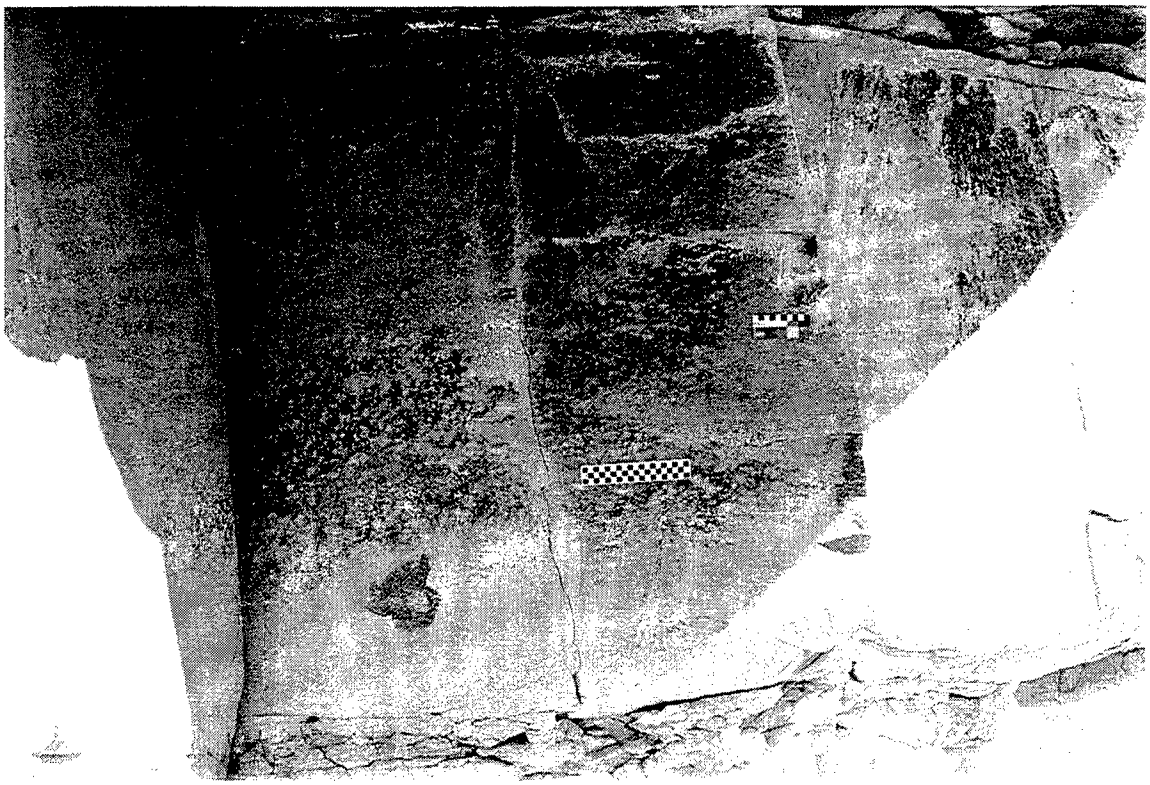
Pictograph Panel B, White River Narrows Locus II (26LN210; BLM 47-4988).



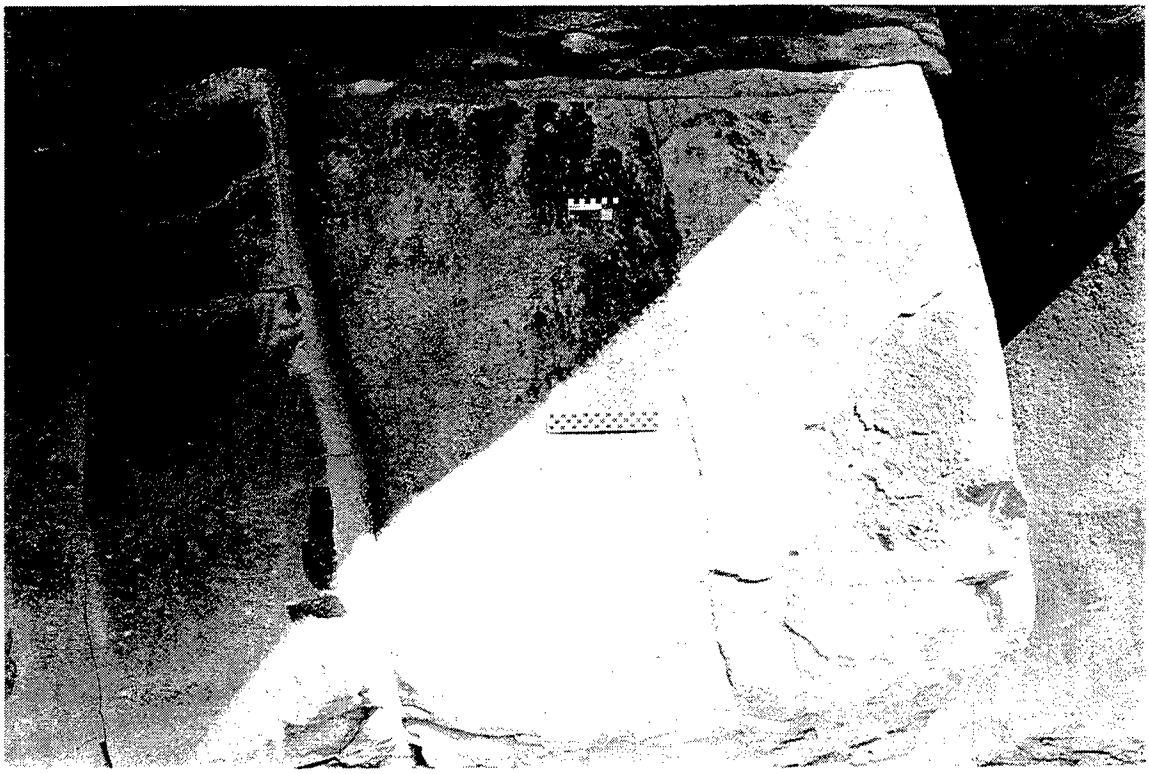
Pictograph Panel C, White River Narrows Locus II (26LN210; BLM 47- 4988).



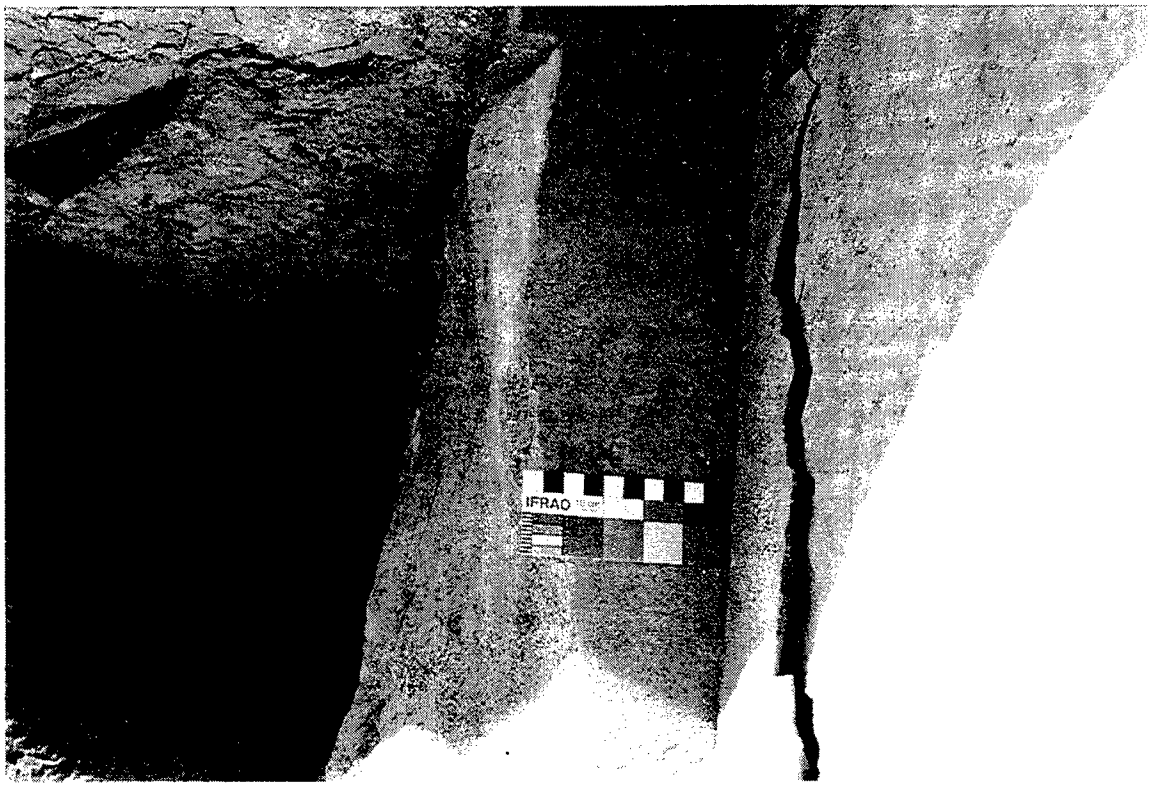
Pictograph Panel D, White River Narrows Locus II (26LN210; BLM 47-4988).



Pictograph Panel E, White River Narrows Locus II (26LN210; BLM 47- 4988).

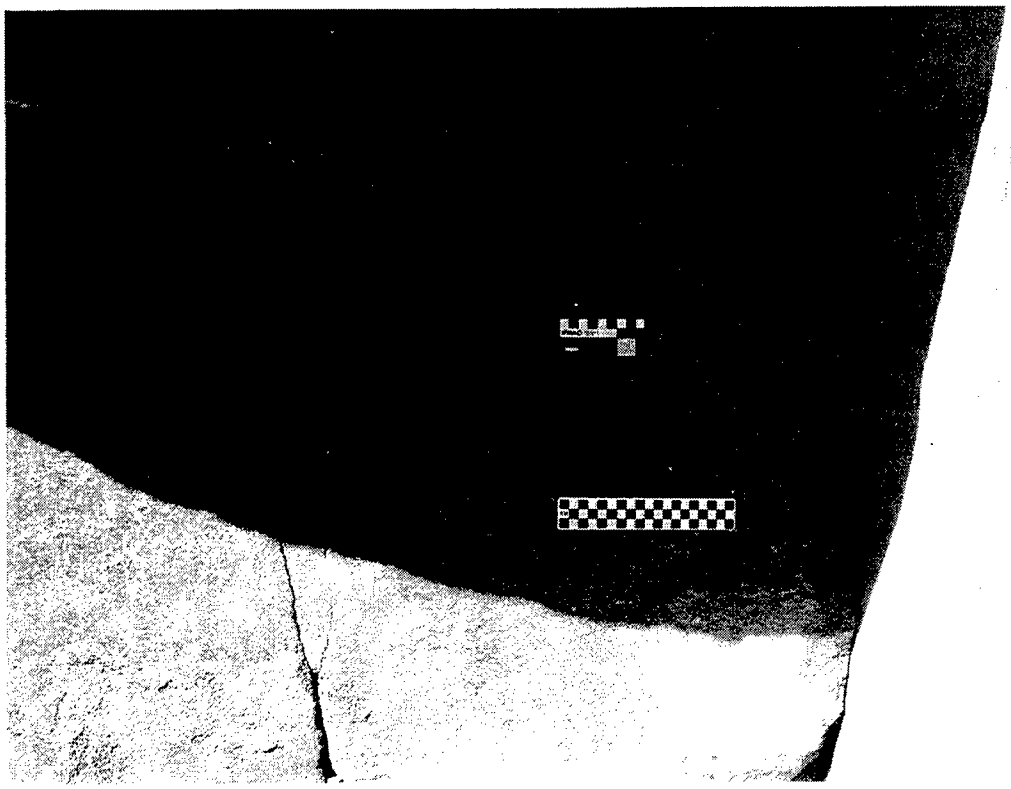


Pictograph Panel F, White River Narrows Locus II (26LN210; BLM 47-4988).

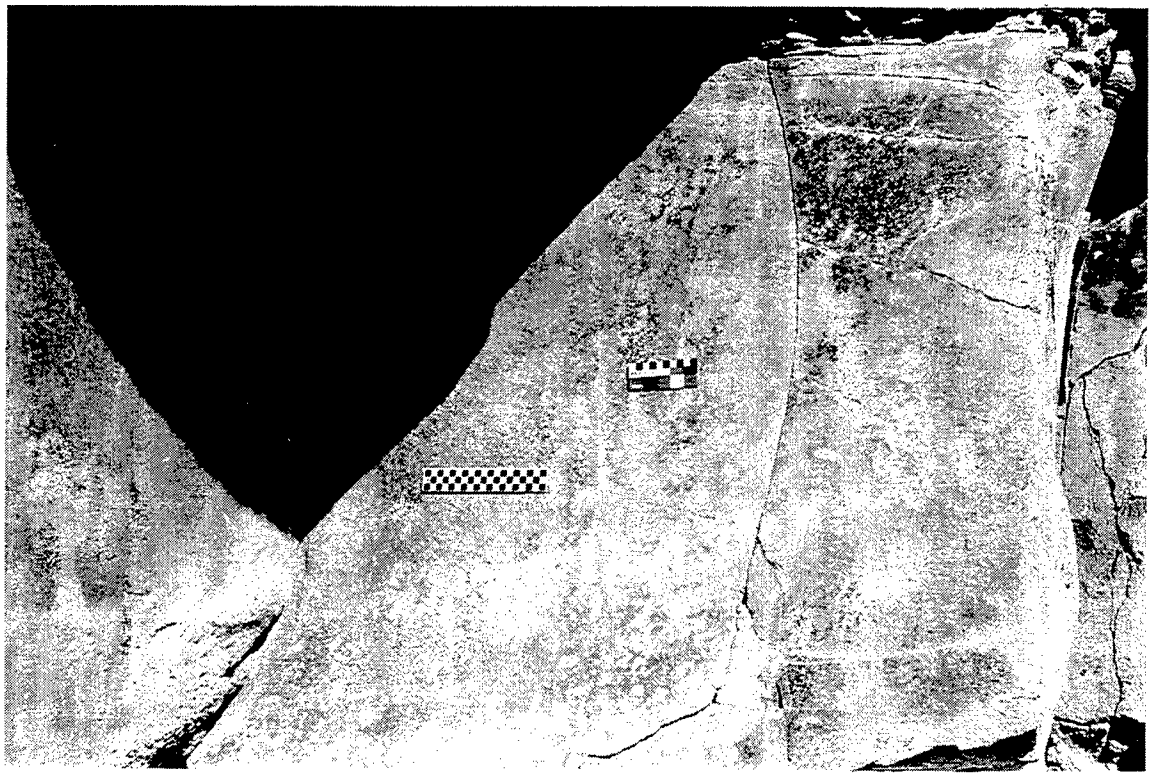


Pictograph Panel G, White River Narrows Locus II (26LN210; BLM 47- 4988).

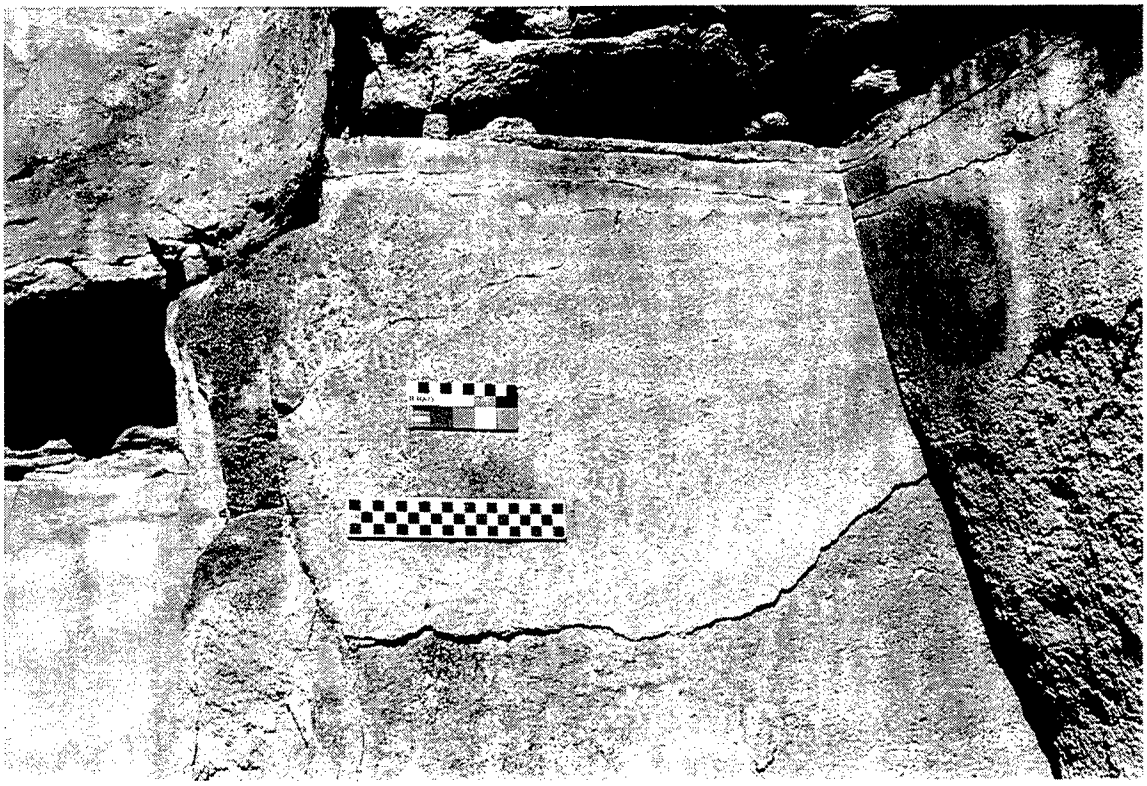
Pictograph Panel H, White River Narrows Locus II (26LN210; BLM 47-4988).



Pictograph Panel I, White River Narrows Locus II (26LN210; BLM 47- 4988).

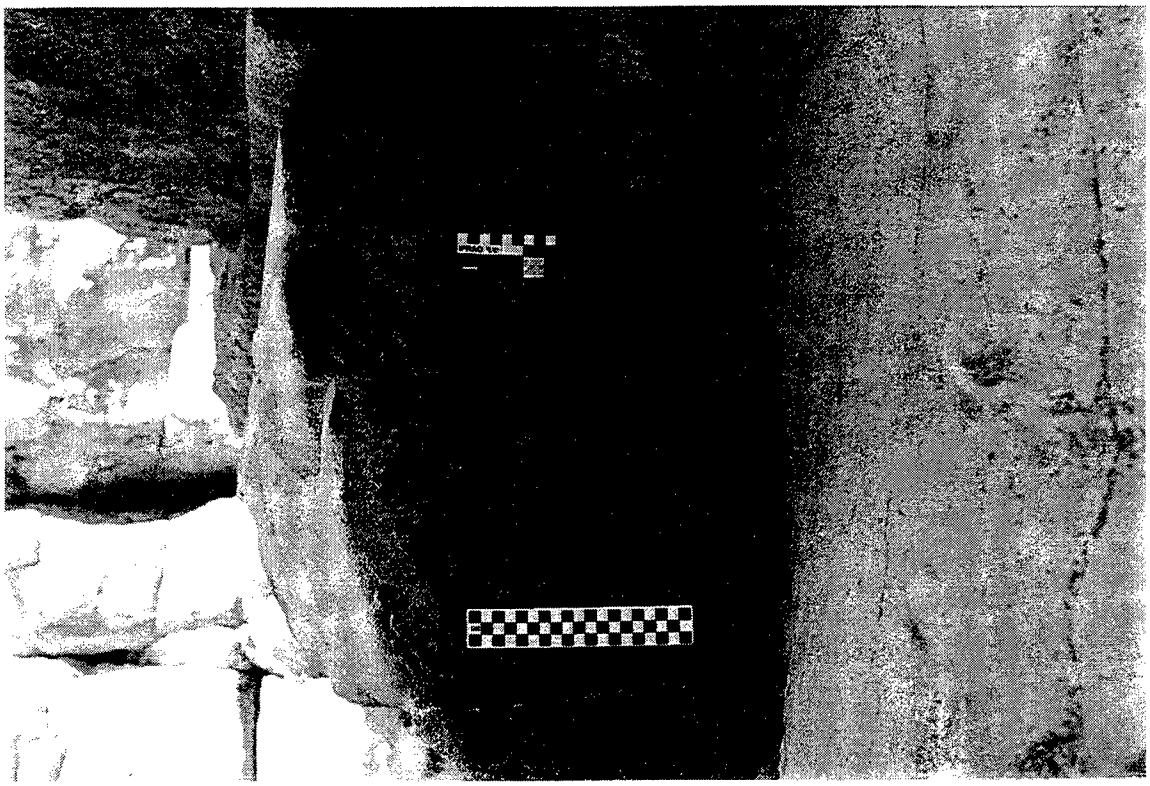


Pictograph Panel J, White River Narrows Locus II (26LN210; BLM 47-4988).

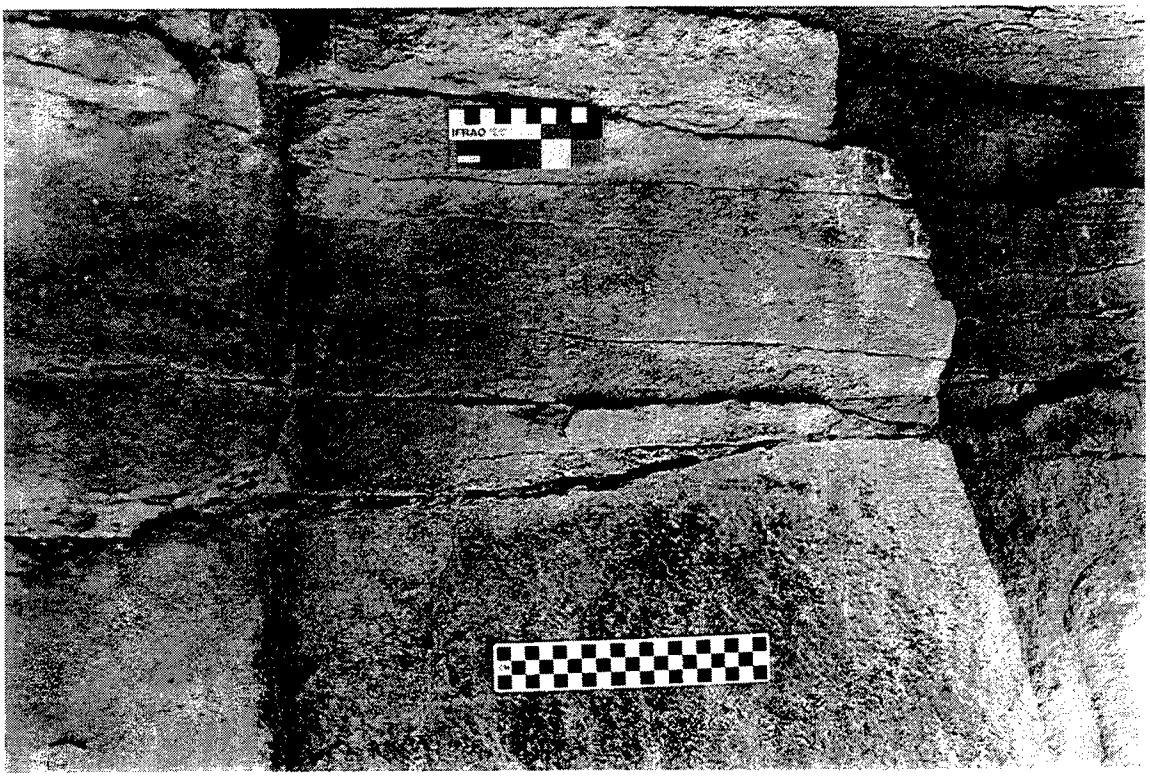


Pictograph Panel K, White River Narrows Locus II (26LN210; BLM 47- 4988).

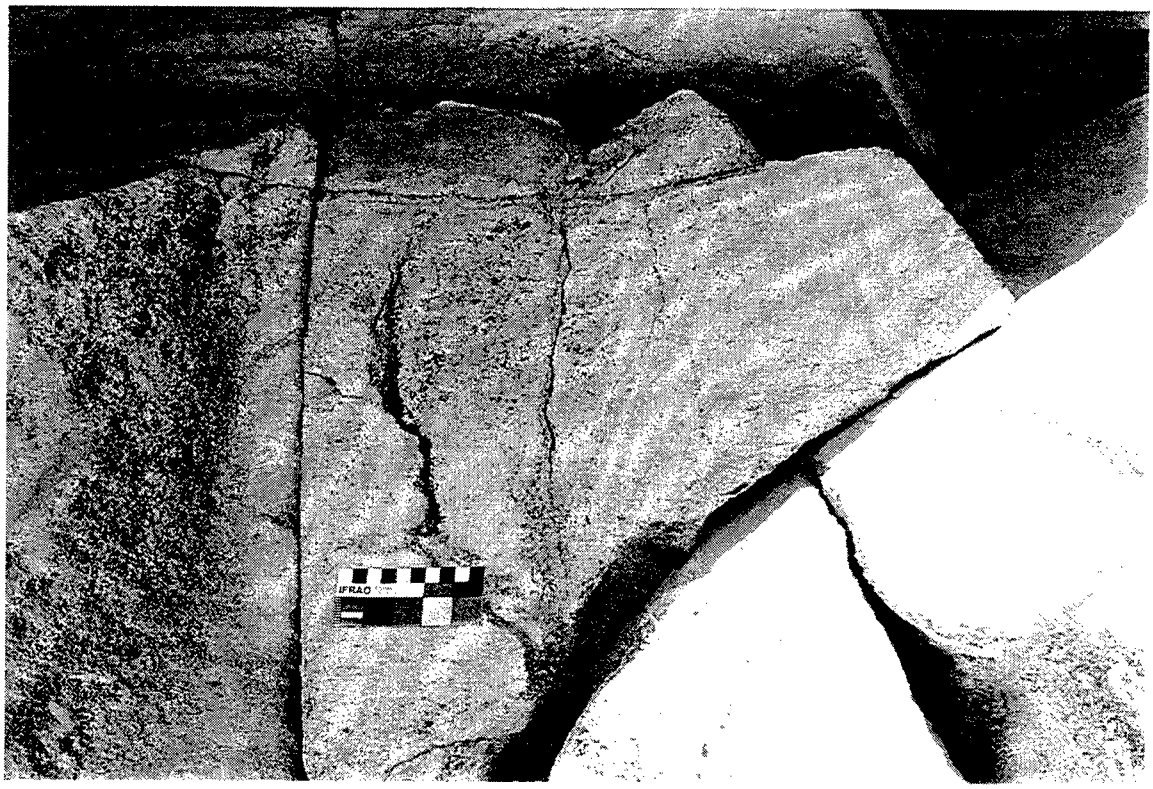
Pictograph Panel L, White River Narrows Locus II (26LN210; BLM 47-4988).



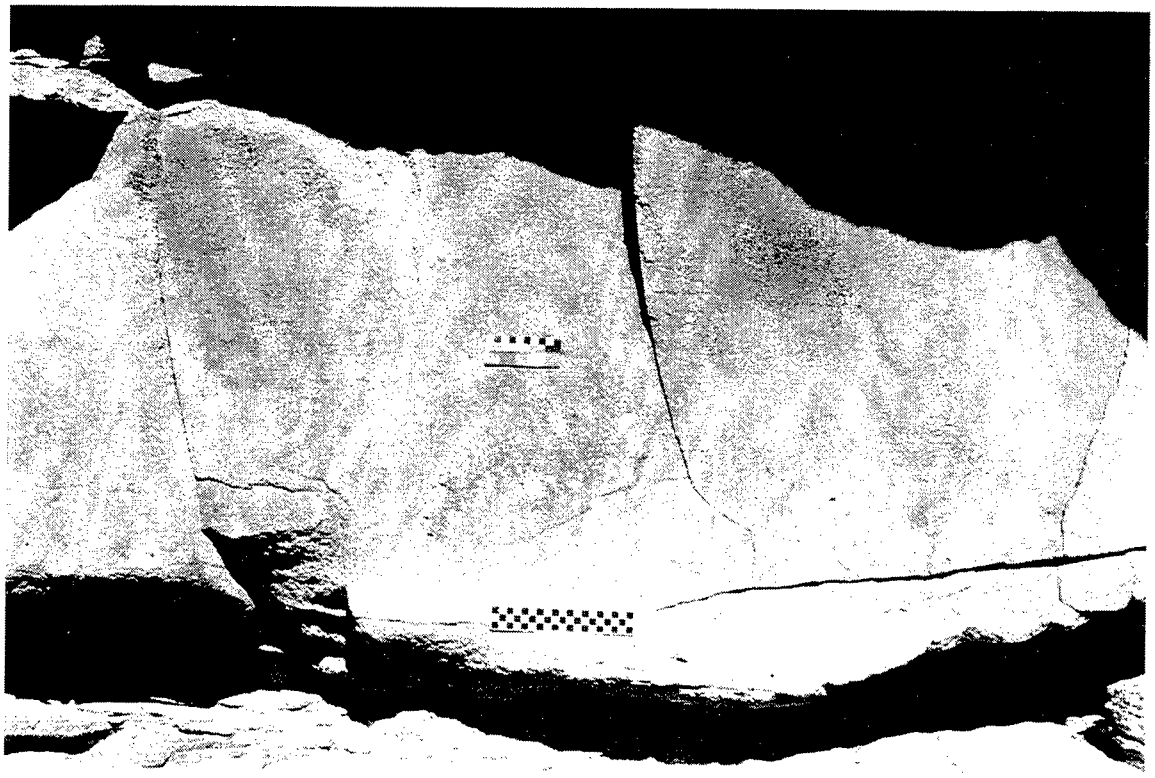
Pictograph Panel M, White River Narrows Locus II (26LN210; BLM 47- 4988).



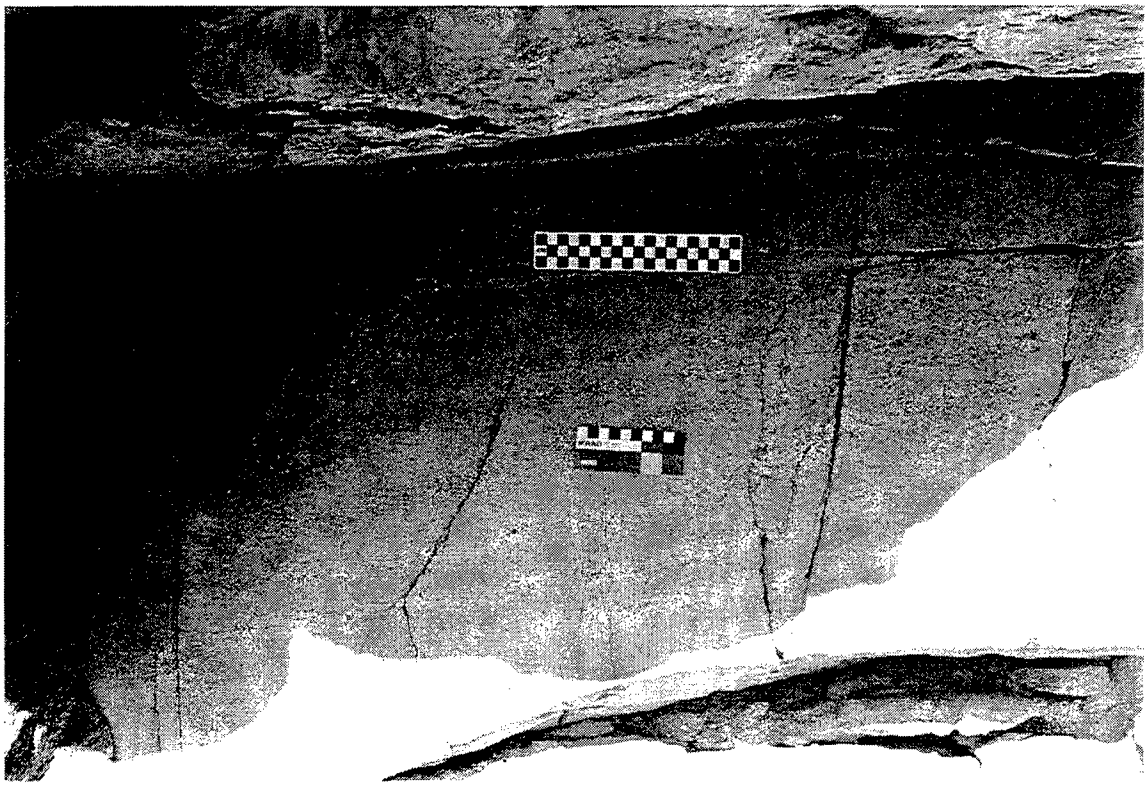
Pictograph Panel N, White River Narrows Locus II (26LN210; BLM 47-4988).



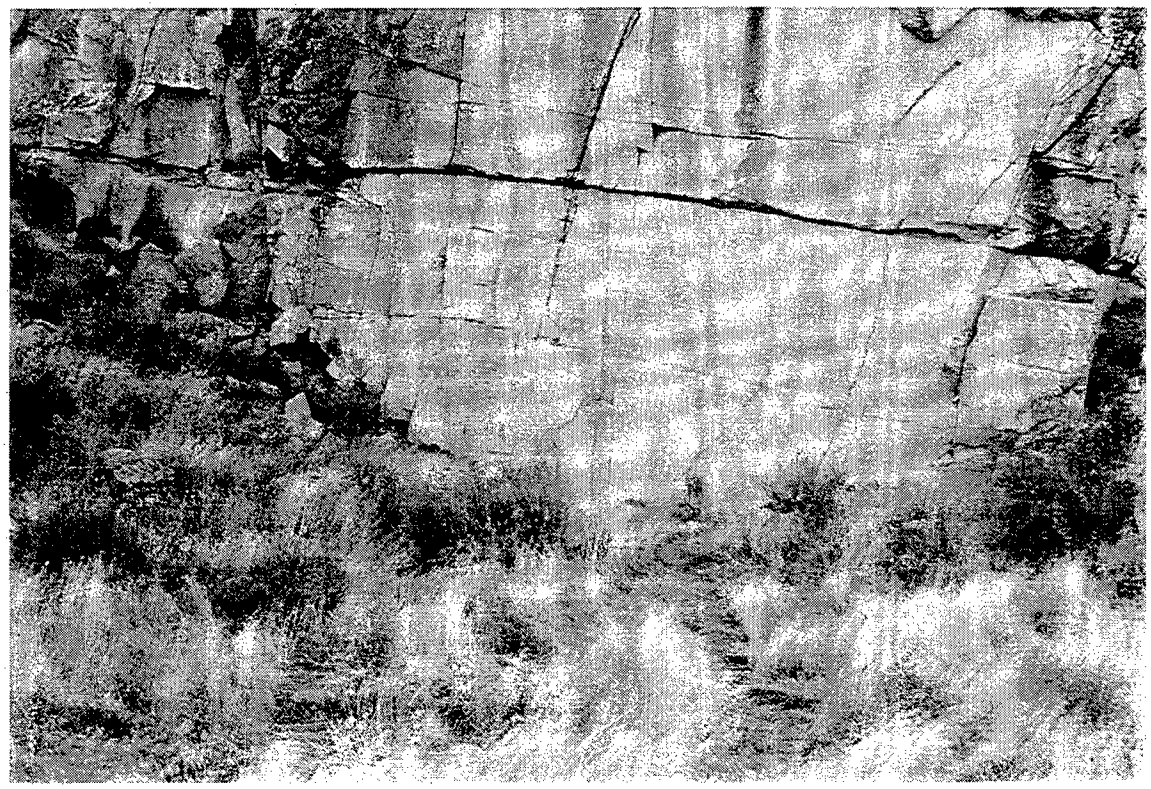
Pictograph Panel O, White River Narrows Locus II (26LN210; BLM 47- 4988).



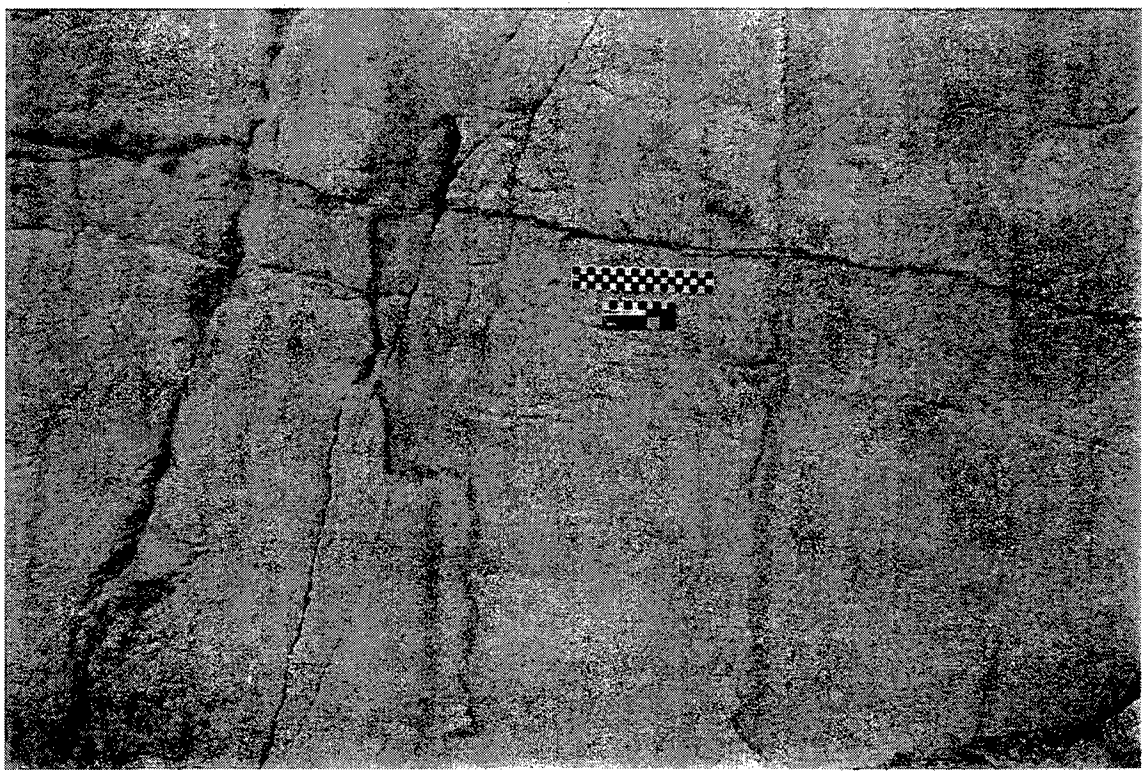
Pictograph Panel P, White River Narrows Locus II (26LN210; BLM 47-4988).



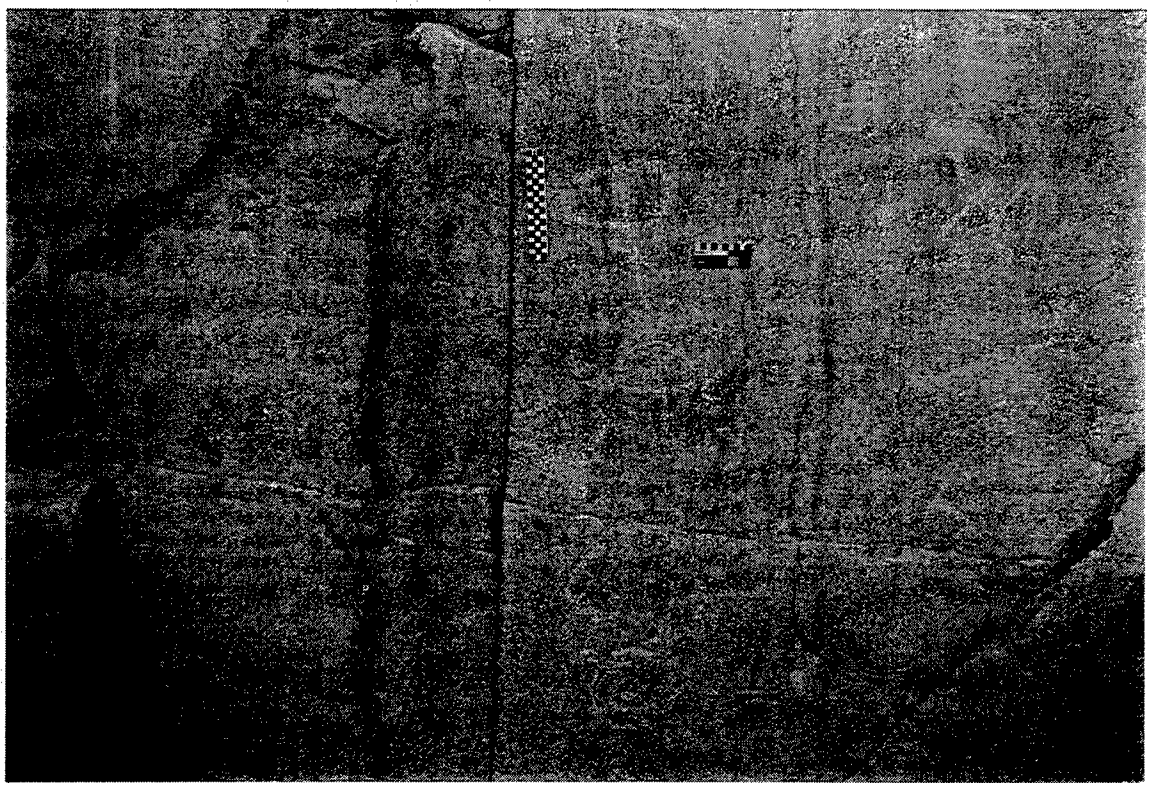
Pictograph Panel Q, White River Narrows Locus II (26LN210; BLM 47- 4988).



General view of White River Narrows Locus III looking east (26LN210; BLM 47- 322).

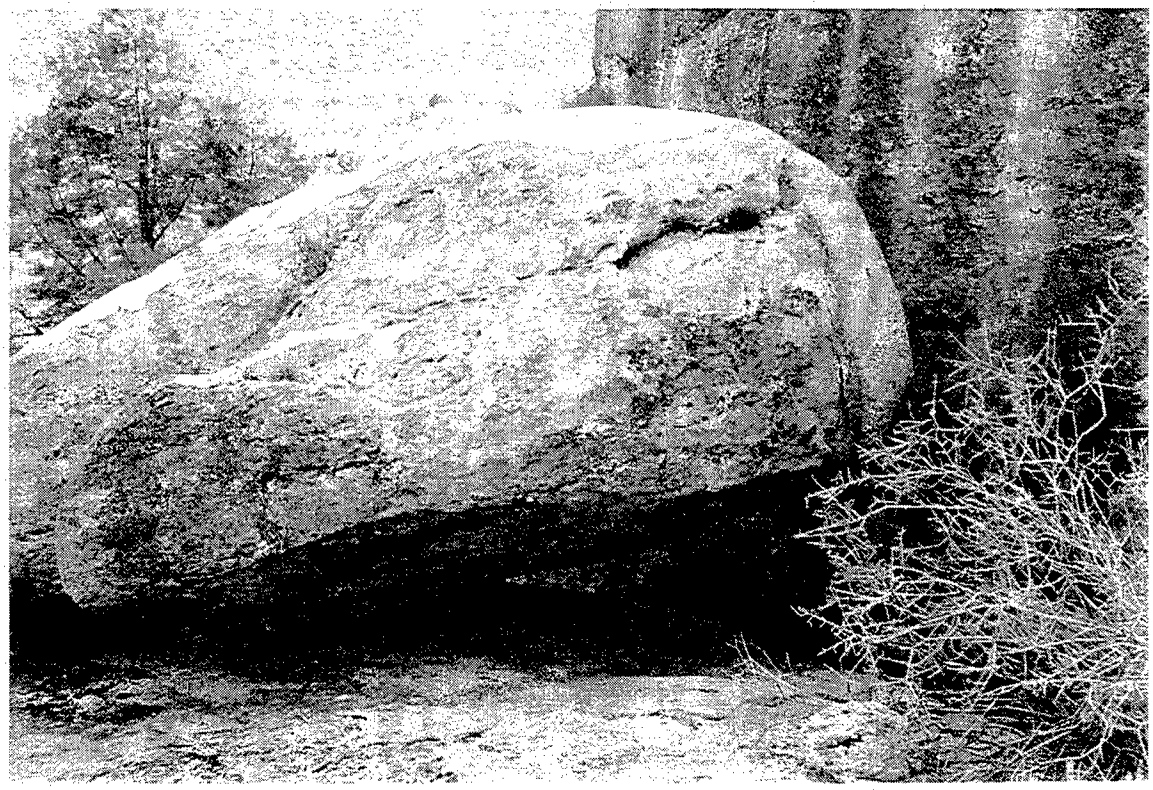


Right section, Petroglyph Panel A, White River Narrows Locus III (26LN210; BLM 47-322).



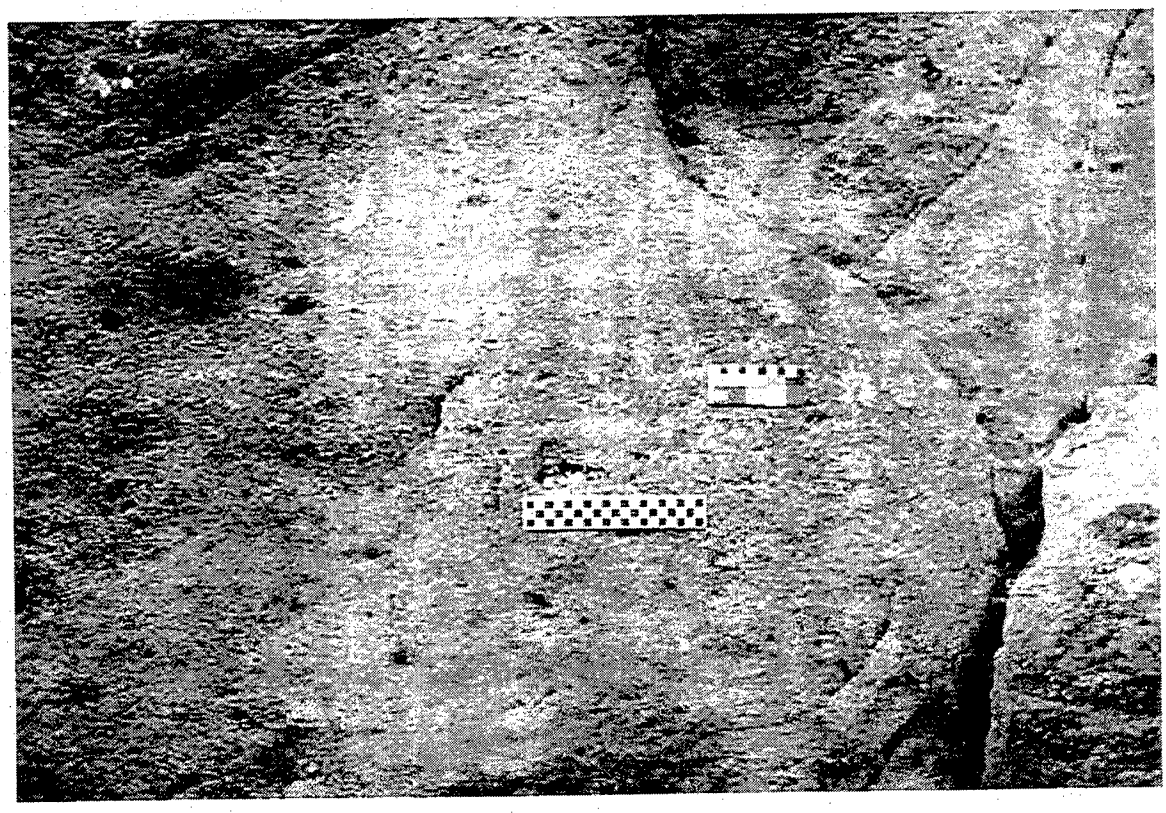
Middle section, Petroglyph Panel A, White River Narrows Locus III (26LN210; BLM 47- 322).

RED PIGMENT CANYON

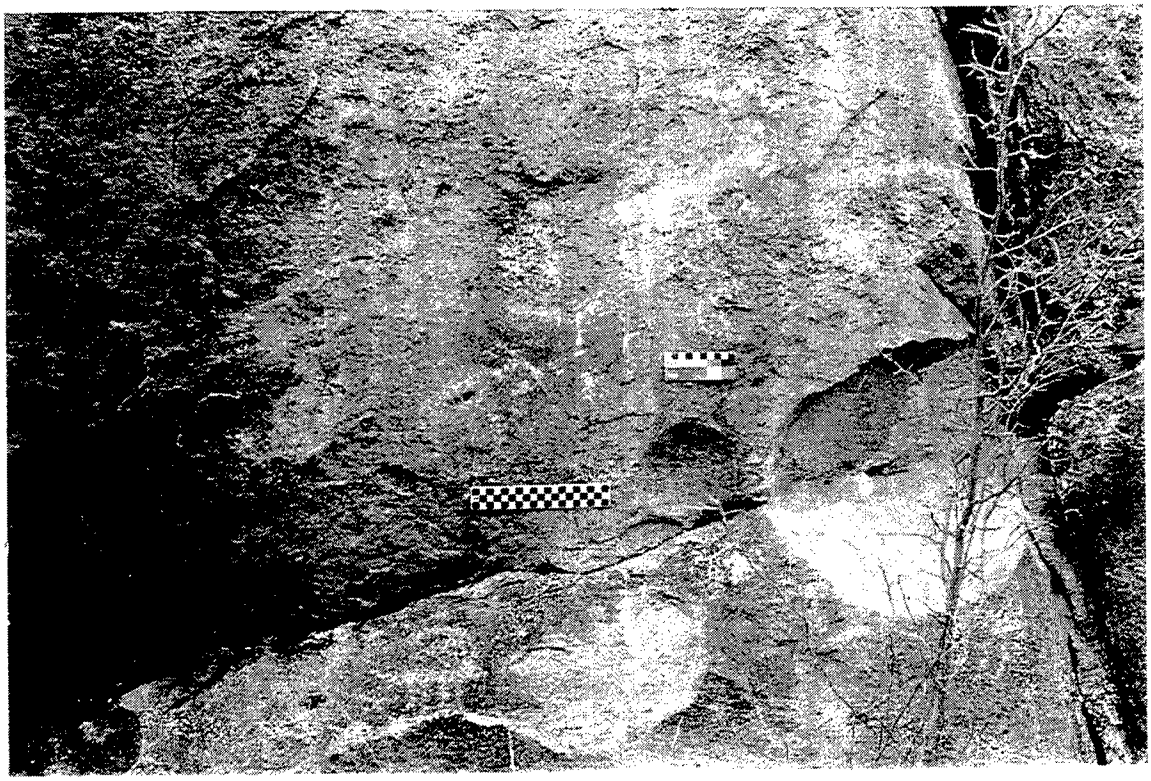


View of milling slicks under boulder, Red Pigment Canyon (26LN4232).

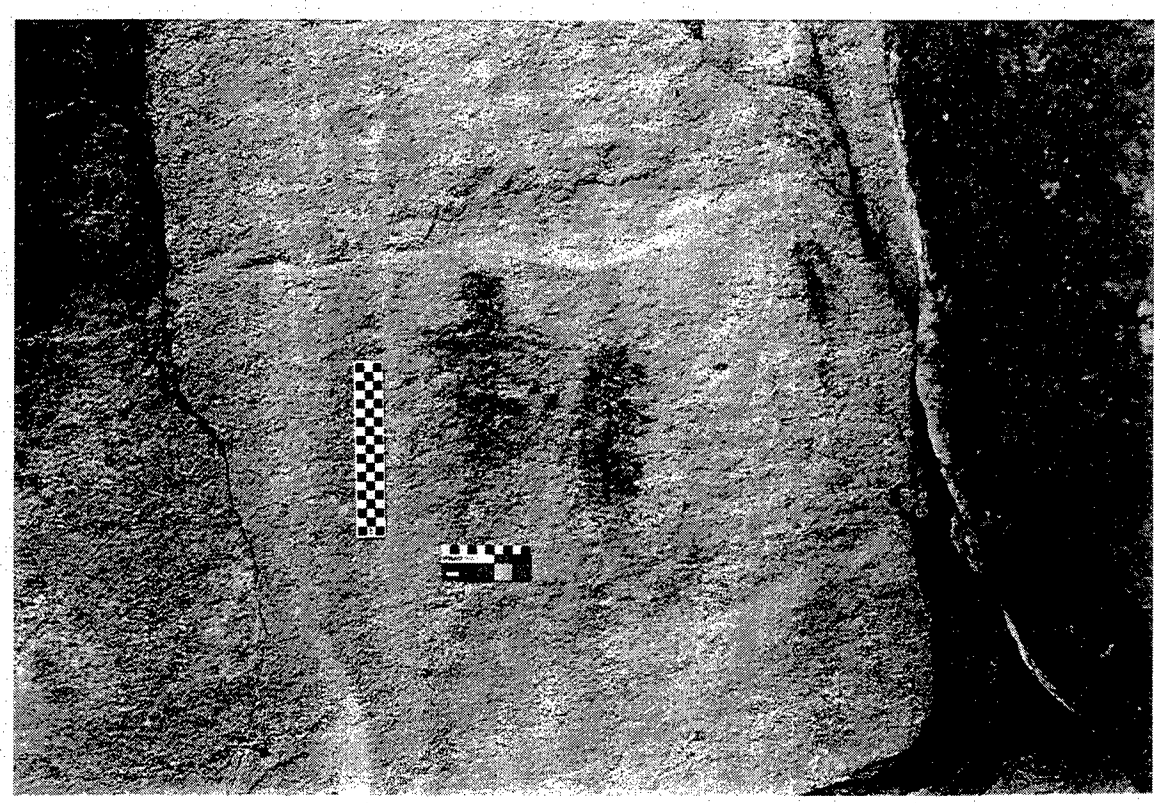
Petroglyph/pictograph Panel A, Red Pigment Canyon (26LN4232).



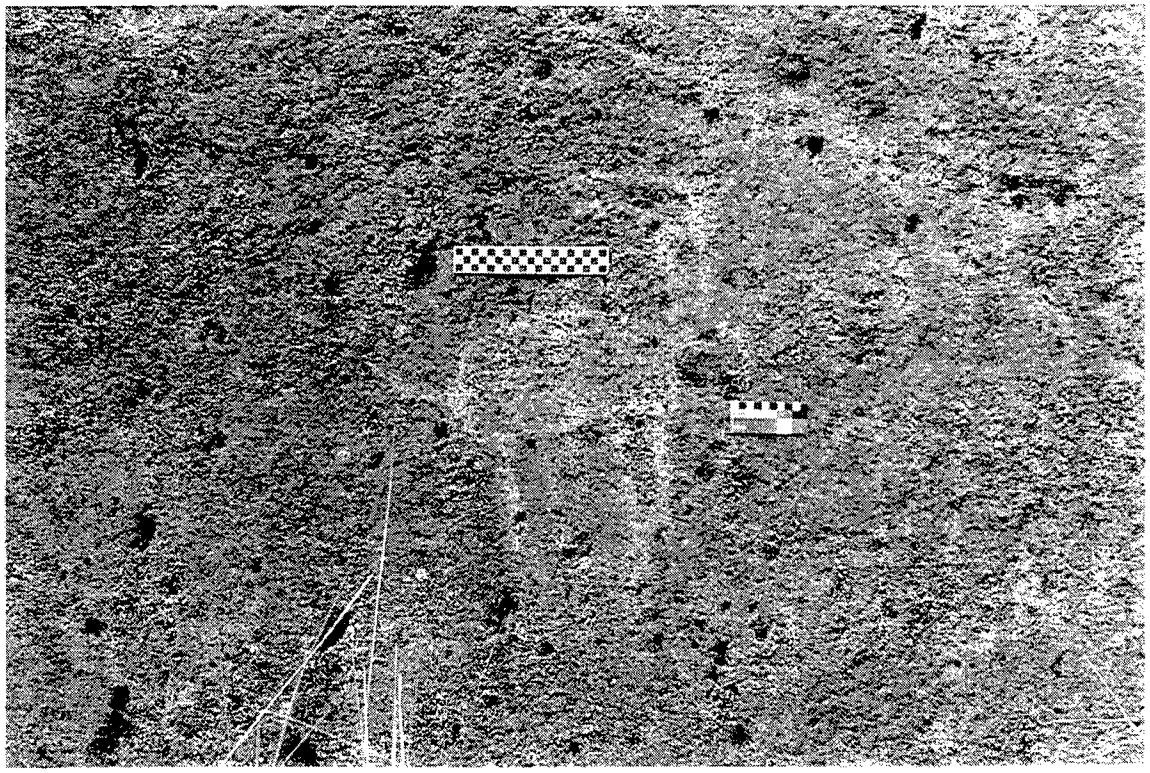
Petroglyph Panel B, Red Pigment Canyon (26LN4232).



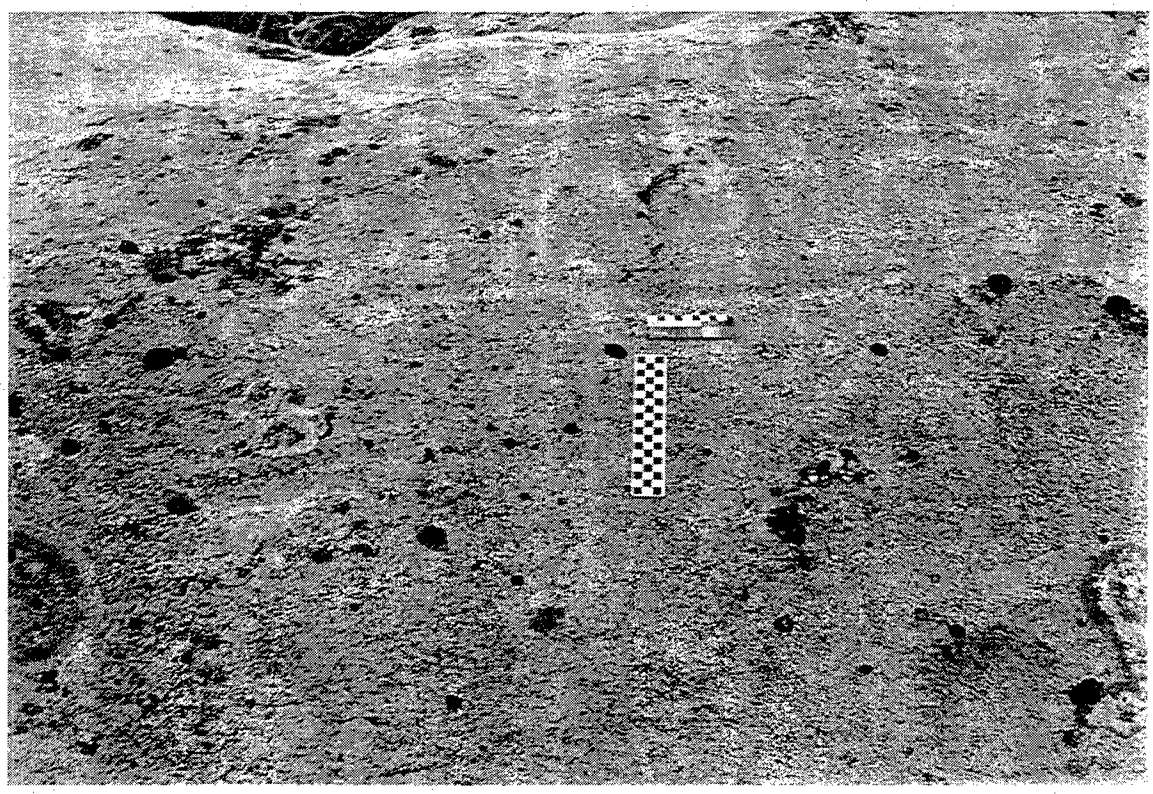
Petroglyph Panel C, Red Pigment Canyon (26LN4232).



Pictograph Panel D, Red Pigment Canyon (26LN4232).

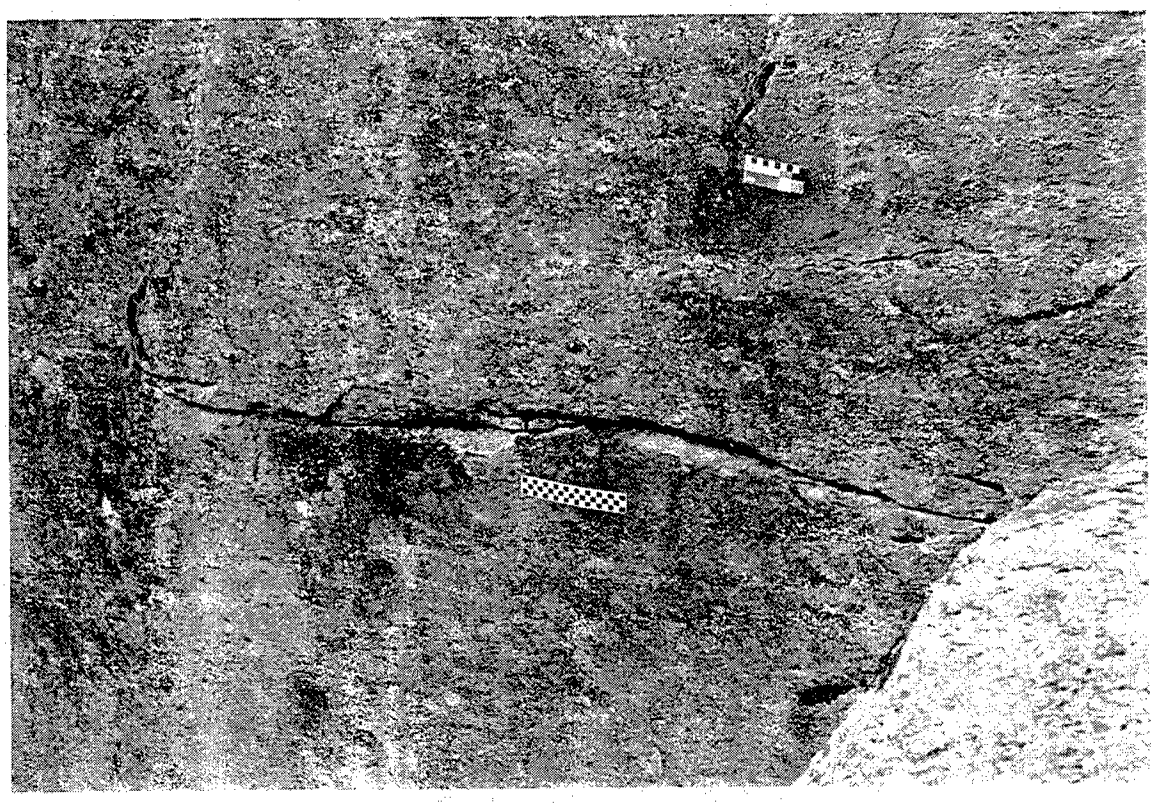


Petroglyph Panel E, Red Pigment Canyon (26LN4232).

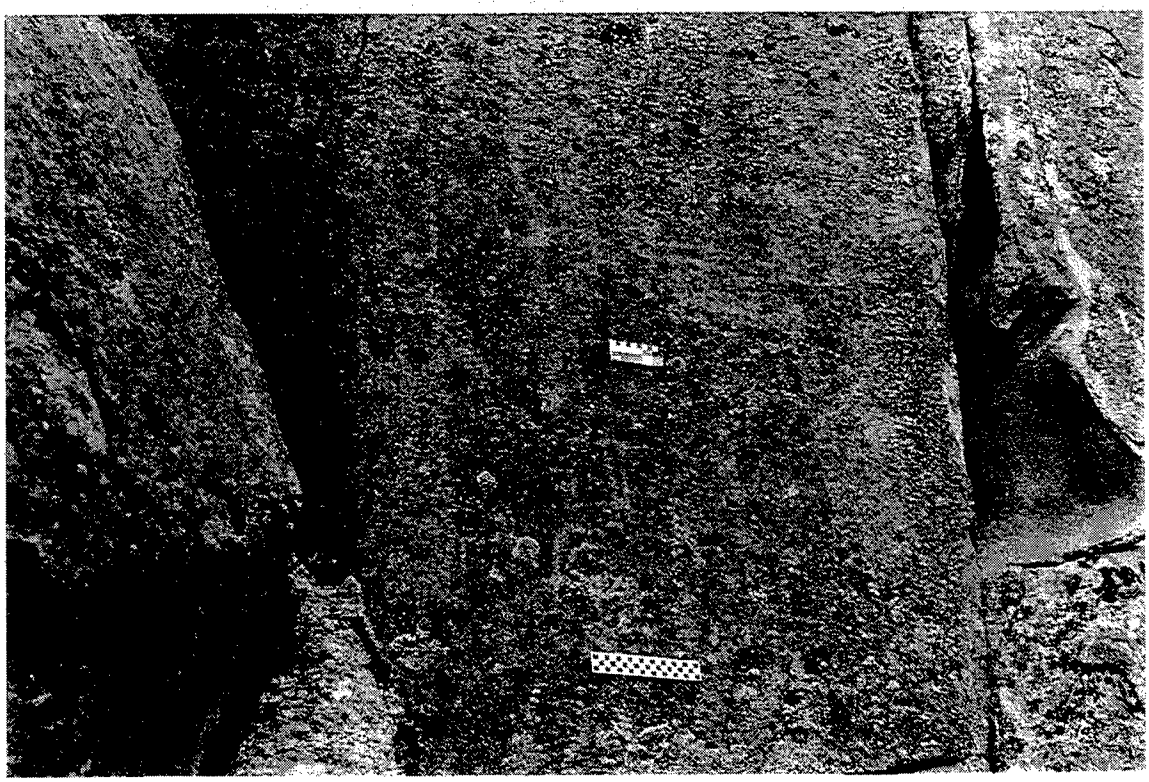


Petroglyph Panel F, Red Pigment Canyon (26LN4232).

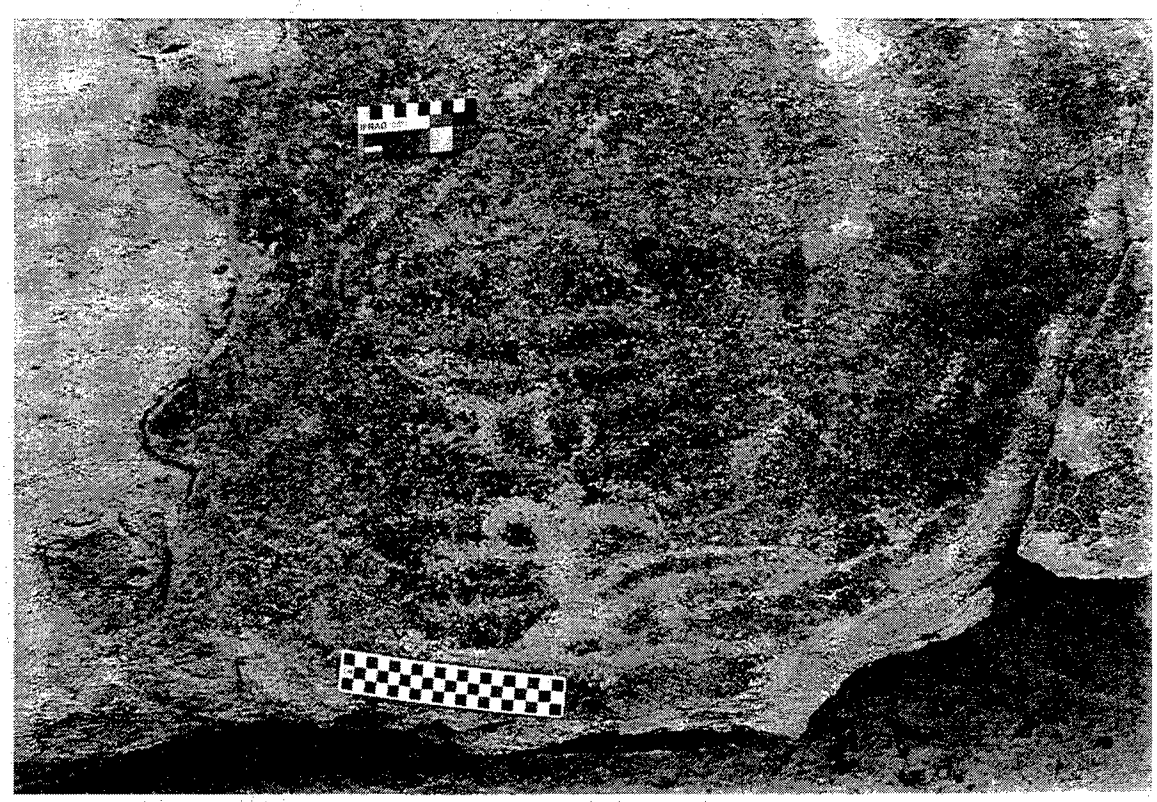
Petroglyph Panel G, Red Pigment Canyon (26LN4232).



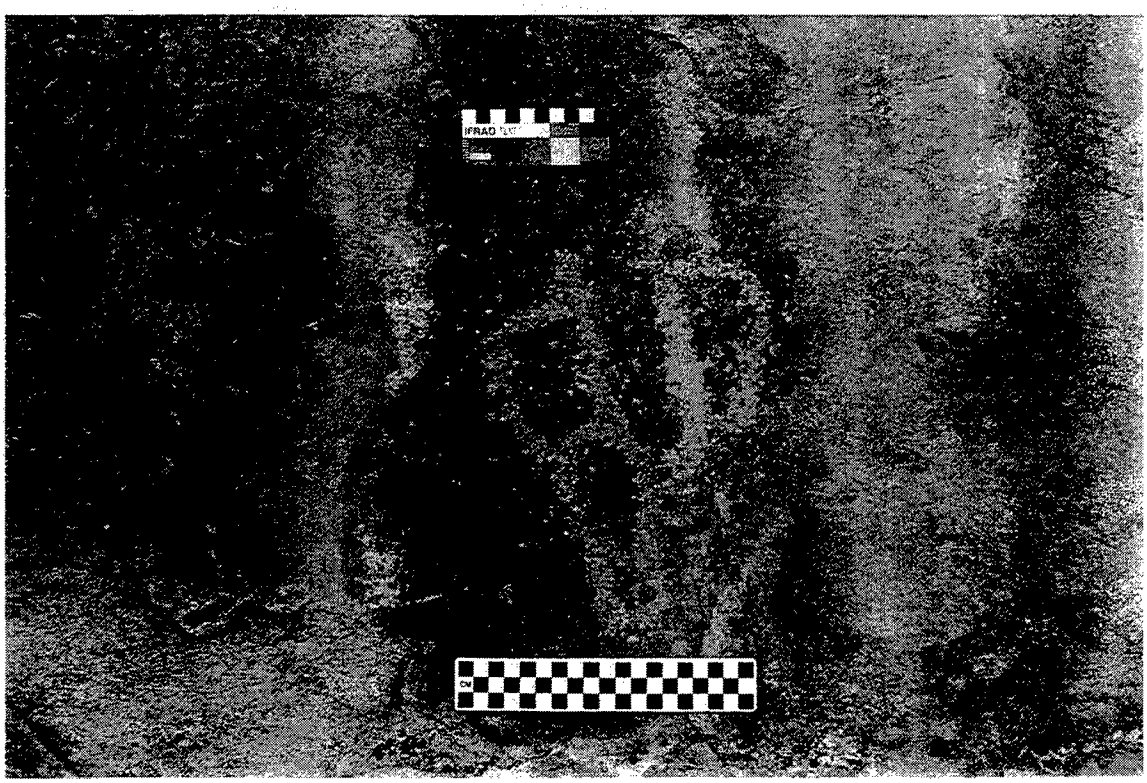
Petroglyph Panel H, Red Pigment Canyon (26LN4232).



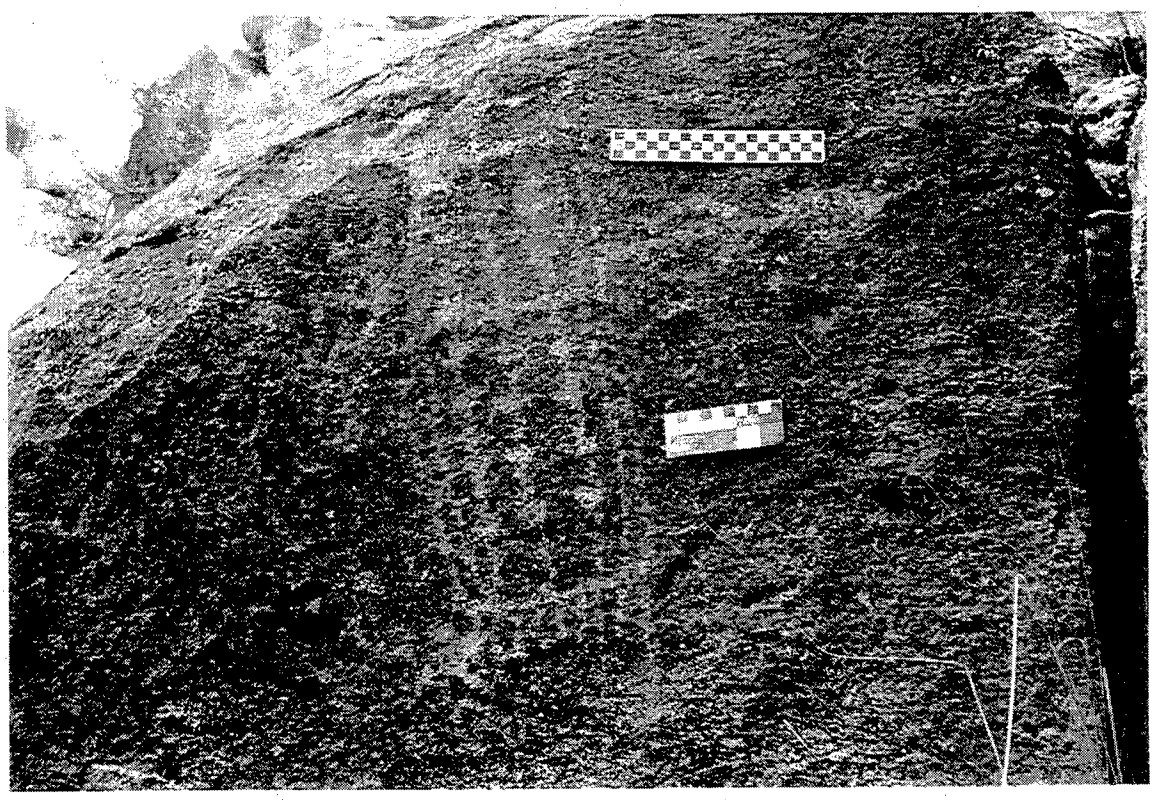
Petroglyph Panel I, Red Pigment Canyon (26LN4232).



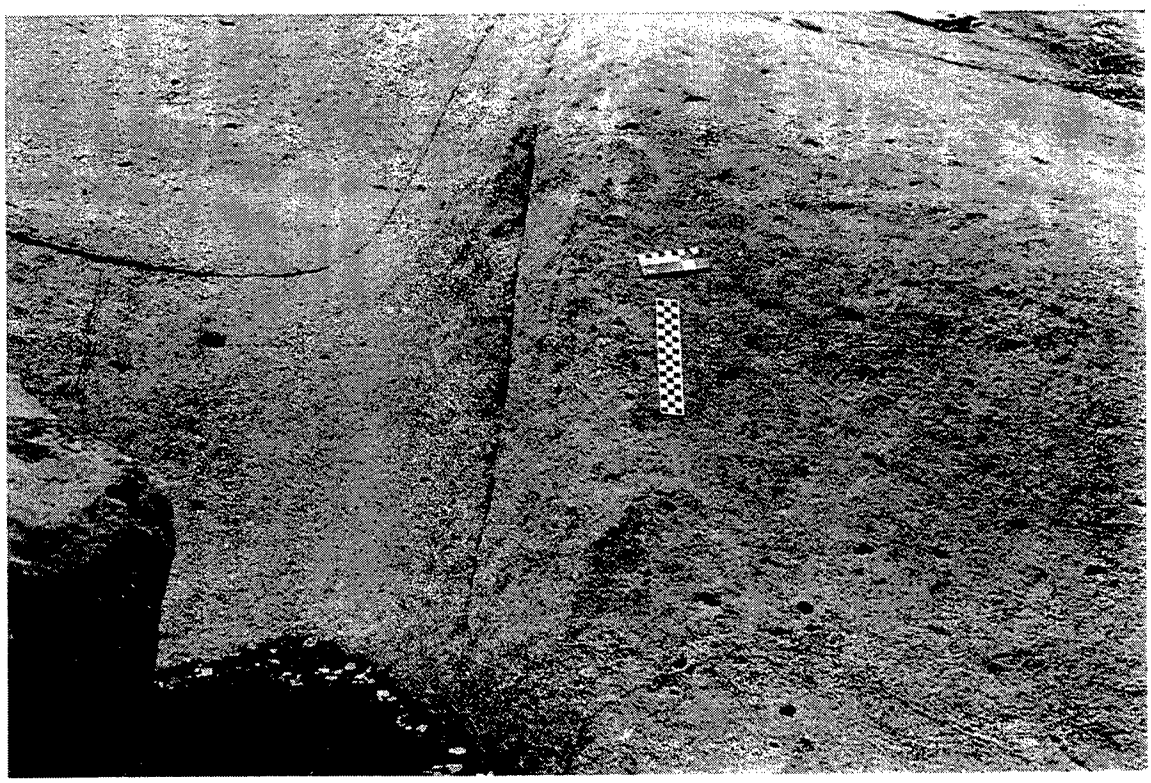
Lower section, petroglyph Panel J, Red Pigment Canyon (26LN4232).



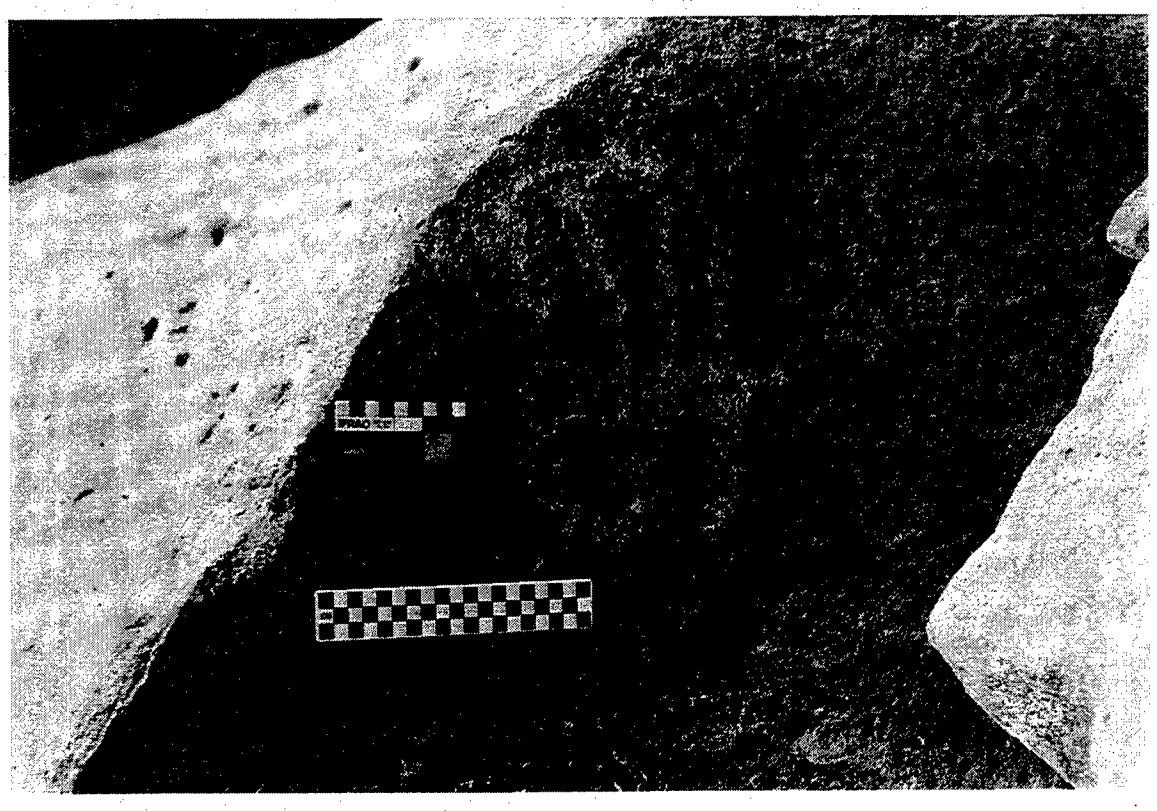
Upper section, petroglyph Panel J, Red Pigment Canyon (26LN4232).



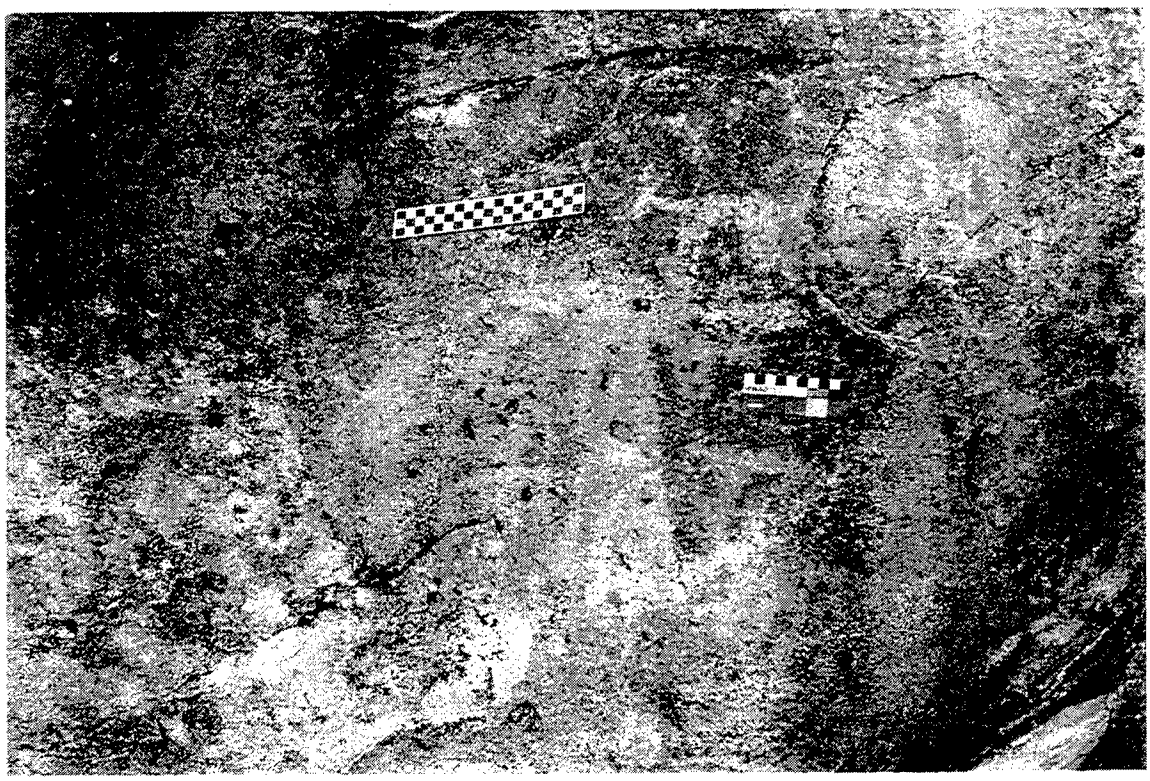
Petroglyph Panel K, Pahranagat patterned body anthropomorph, Red Pigment Canyon (26LN4232).



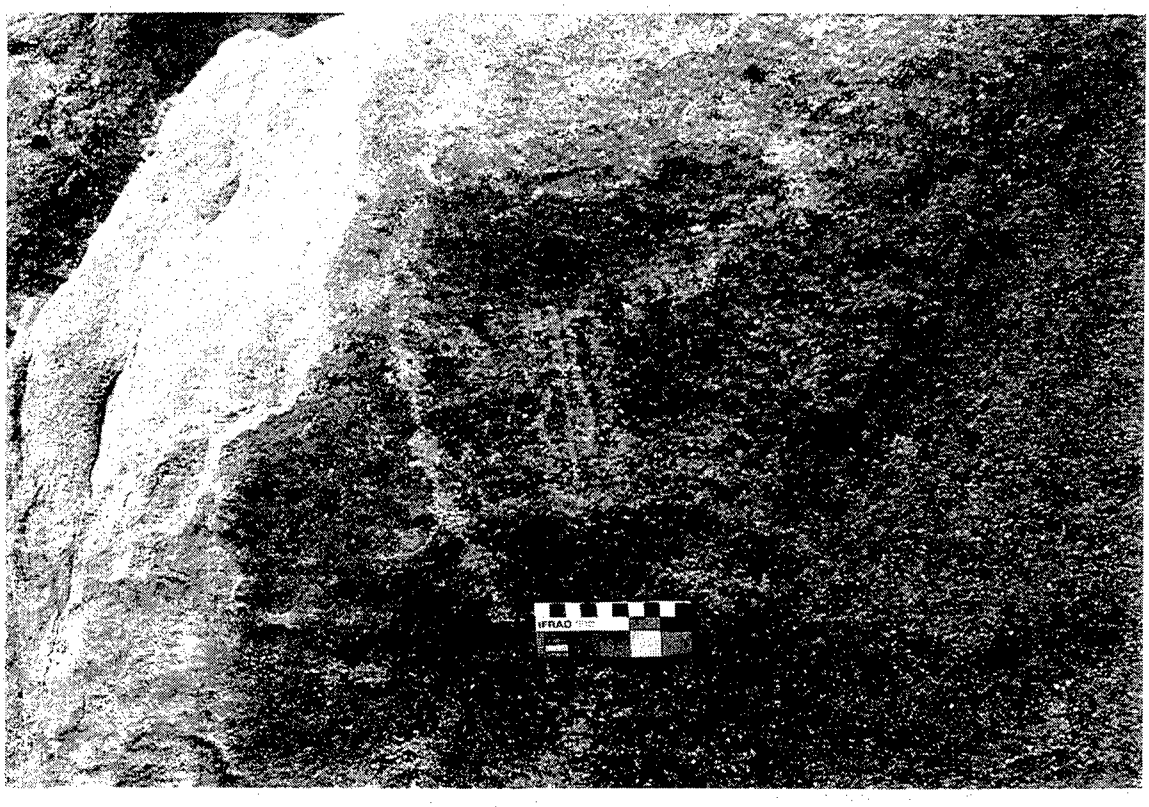
Petroglyph Panel L, Red Pigment Canyon (26LN4232).



Petroglyph Panel M, Red Pigment Canyon (26LN4232).

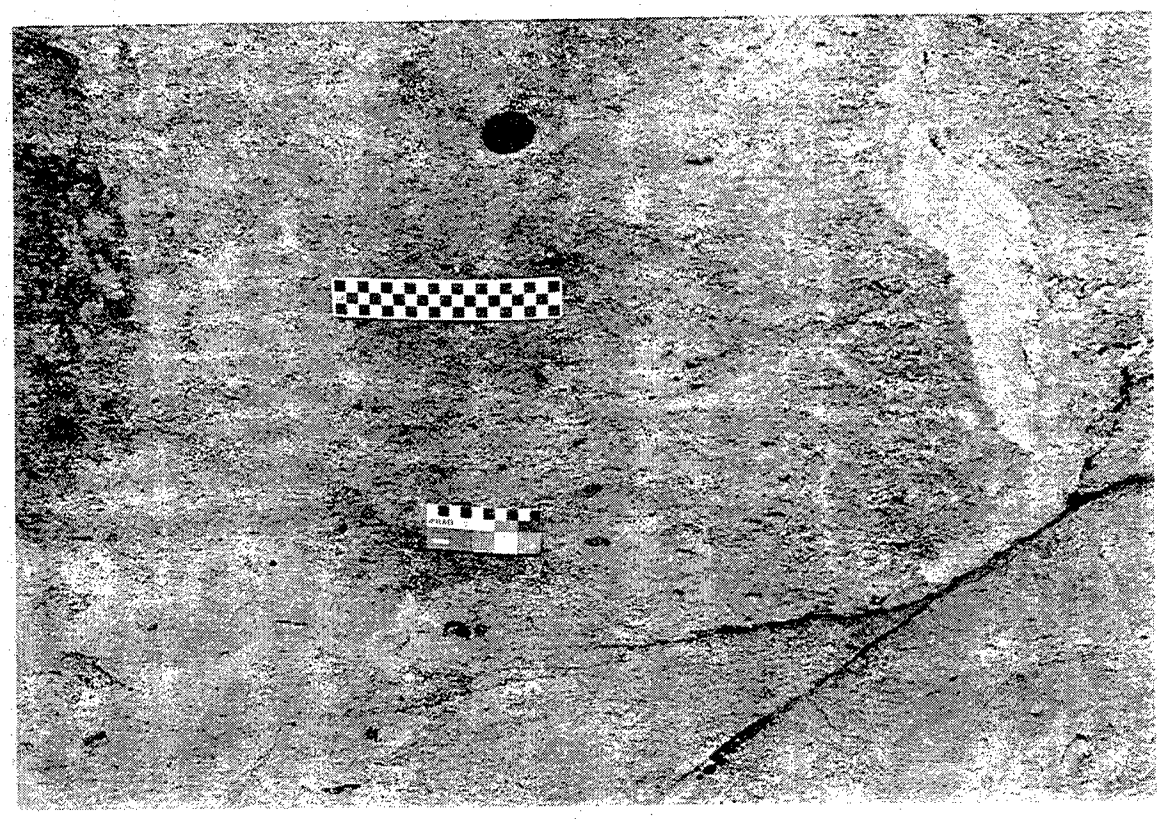


Petroglyph Panel N, Red Pigment Canyon (26LN4232).

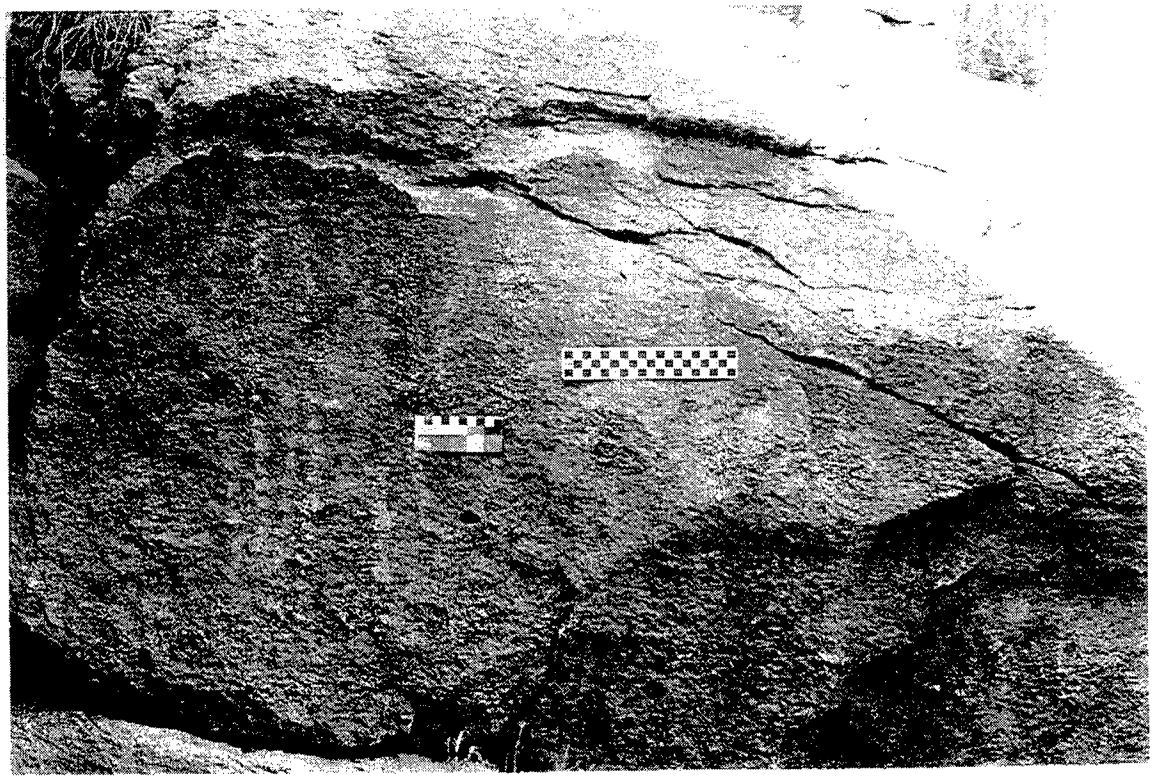


Petroglyph Panel O, Red Pigment Canyon (26LN4232).

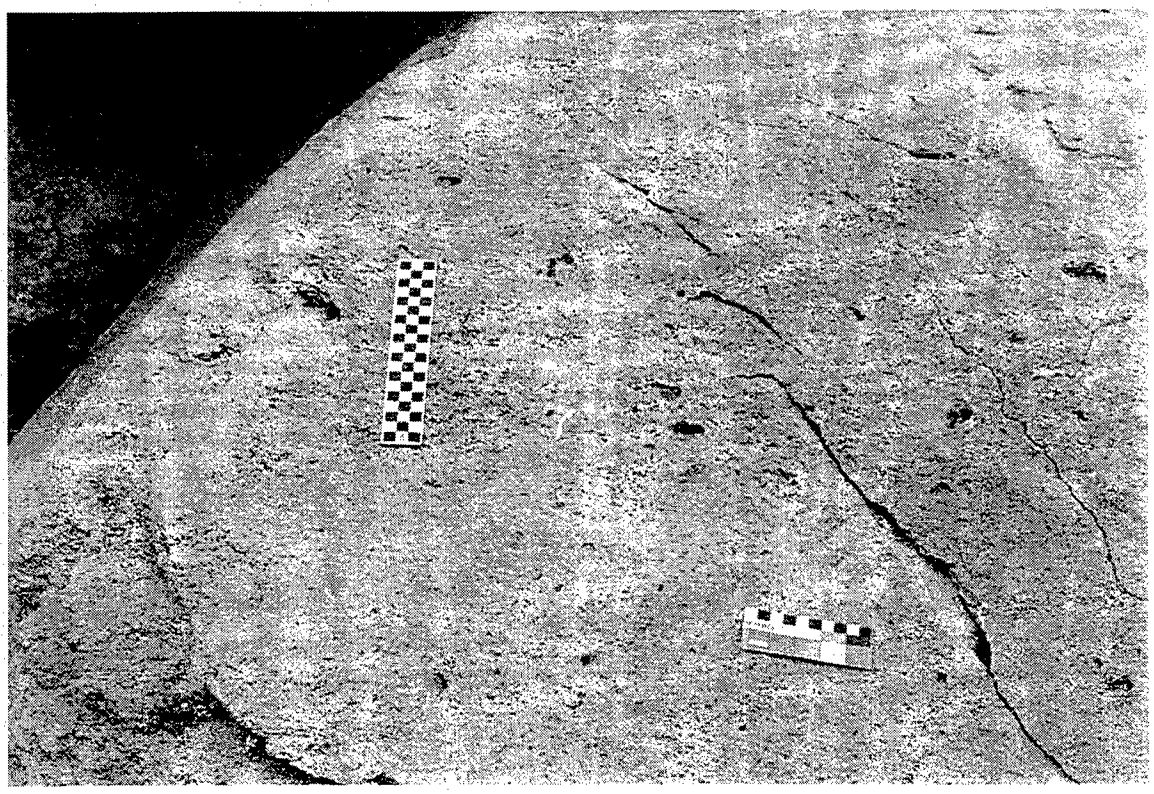
yph Panel P, Red Pigment Canyon (26LN4232).



Petroglyph Panel Q, Red Pigment Canyon (26LN4232).

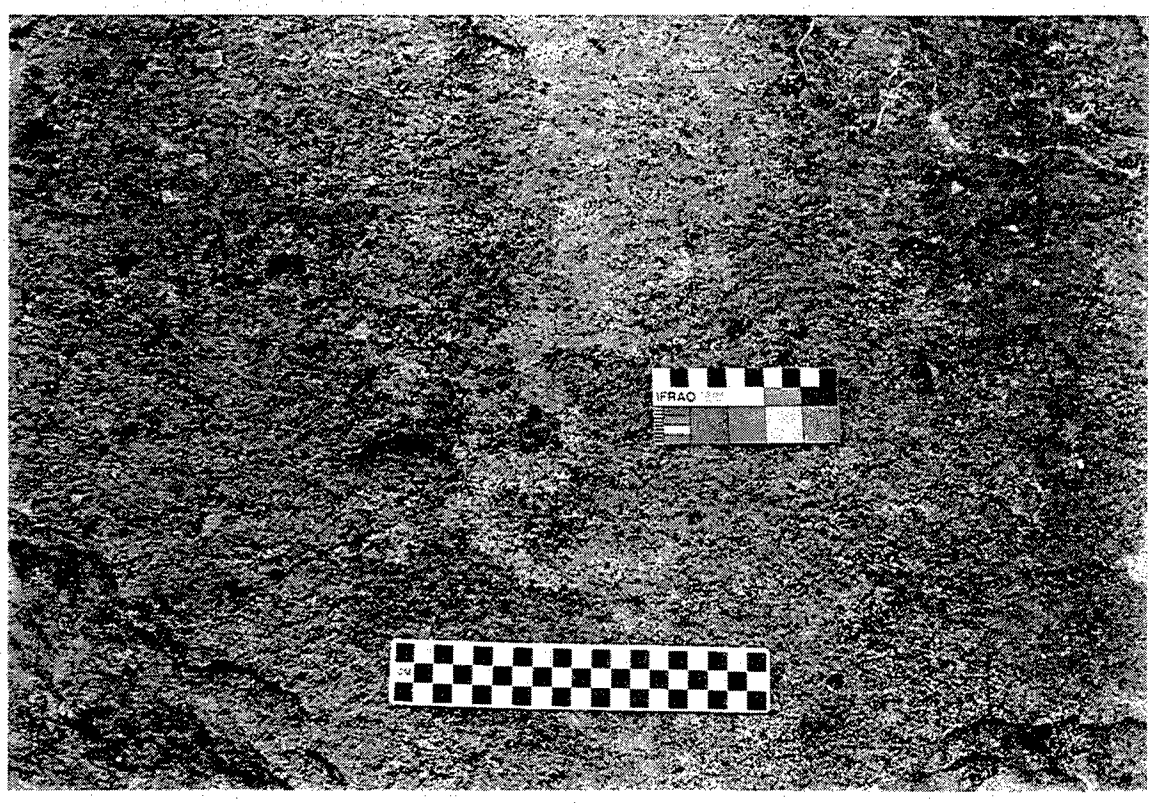


Petroglyph Panel R, Red Pigment Canyon (26LN4232).

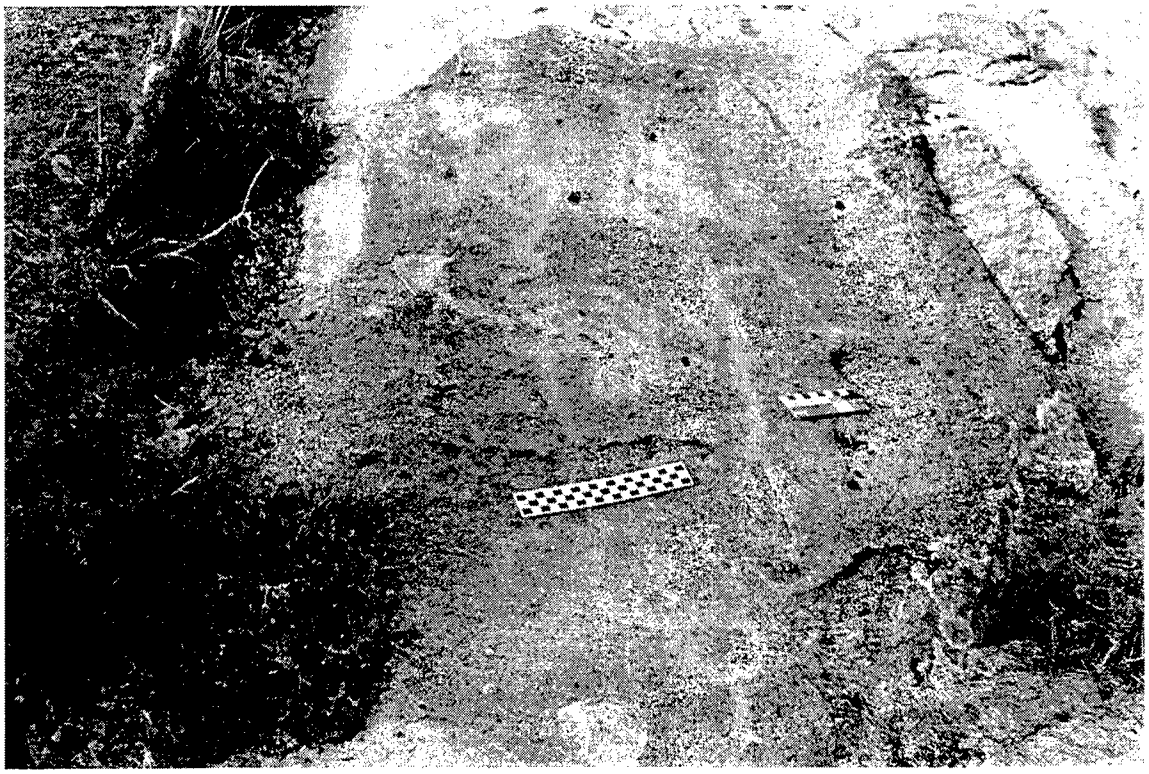


Petroglyph Panel S, Red Pigment Canyon (26LN4232).

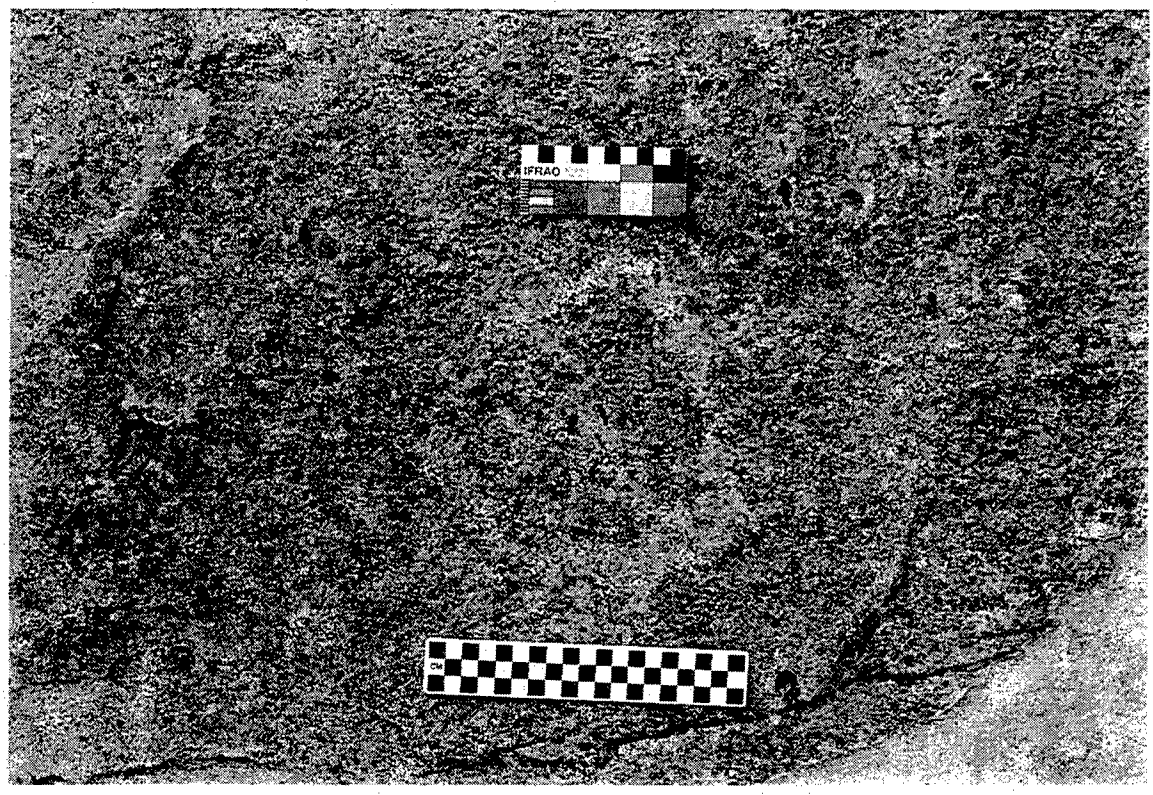
Petroglyph Panel T, Red Pigment Canyon (26LN4232).



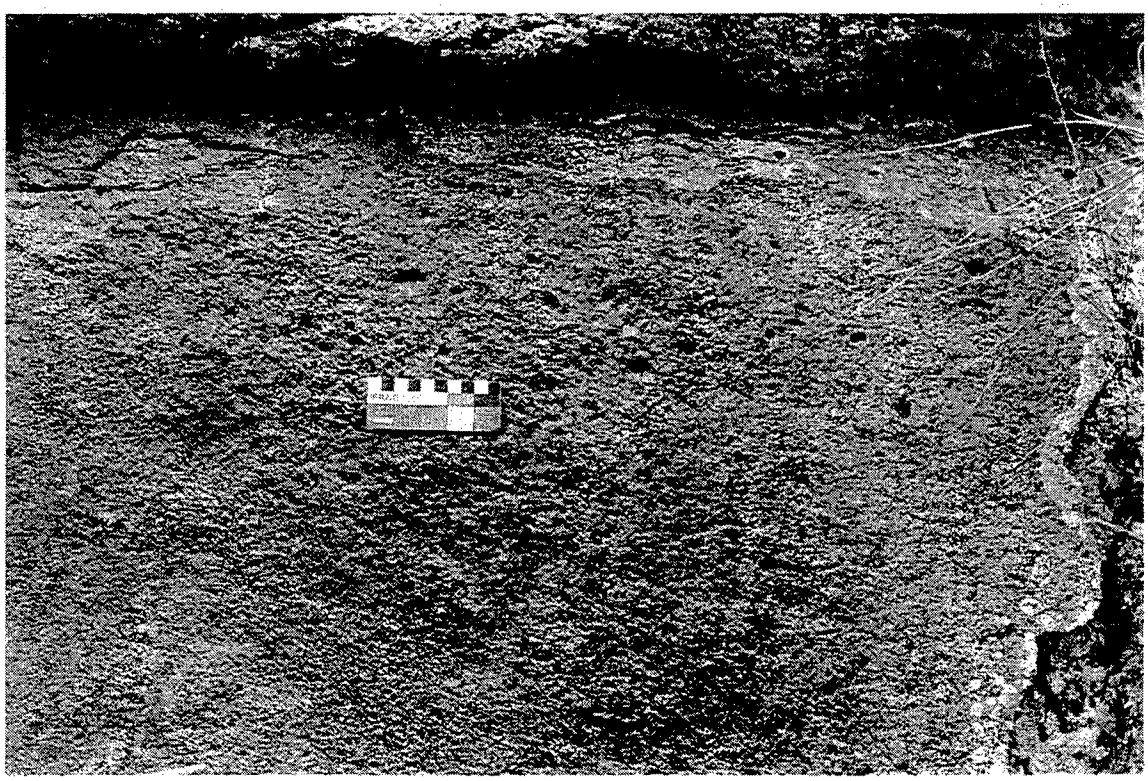
Petroglyph Panel U, Red Pigment Canyon (26LN4232).



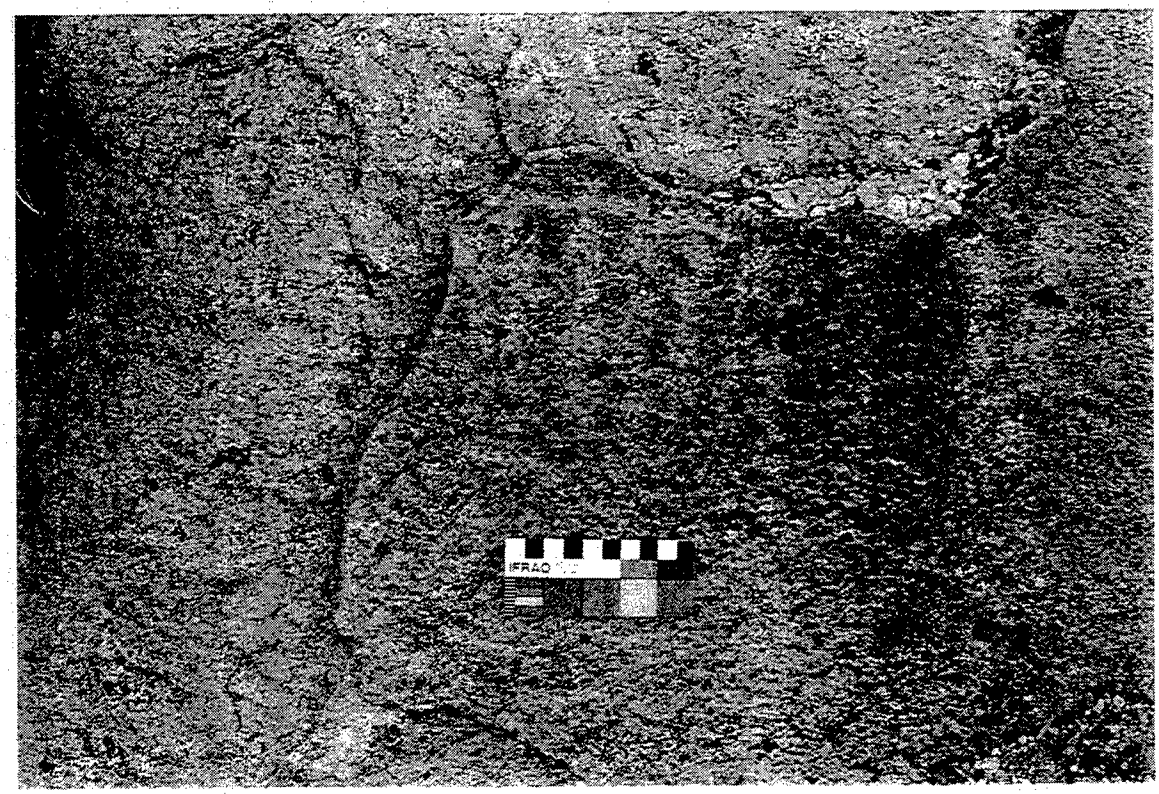
Petroglyph Panel V, Red Pigment Canyon (26LN4232).



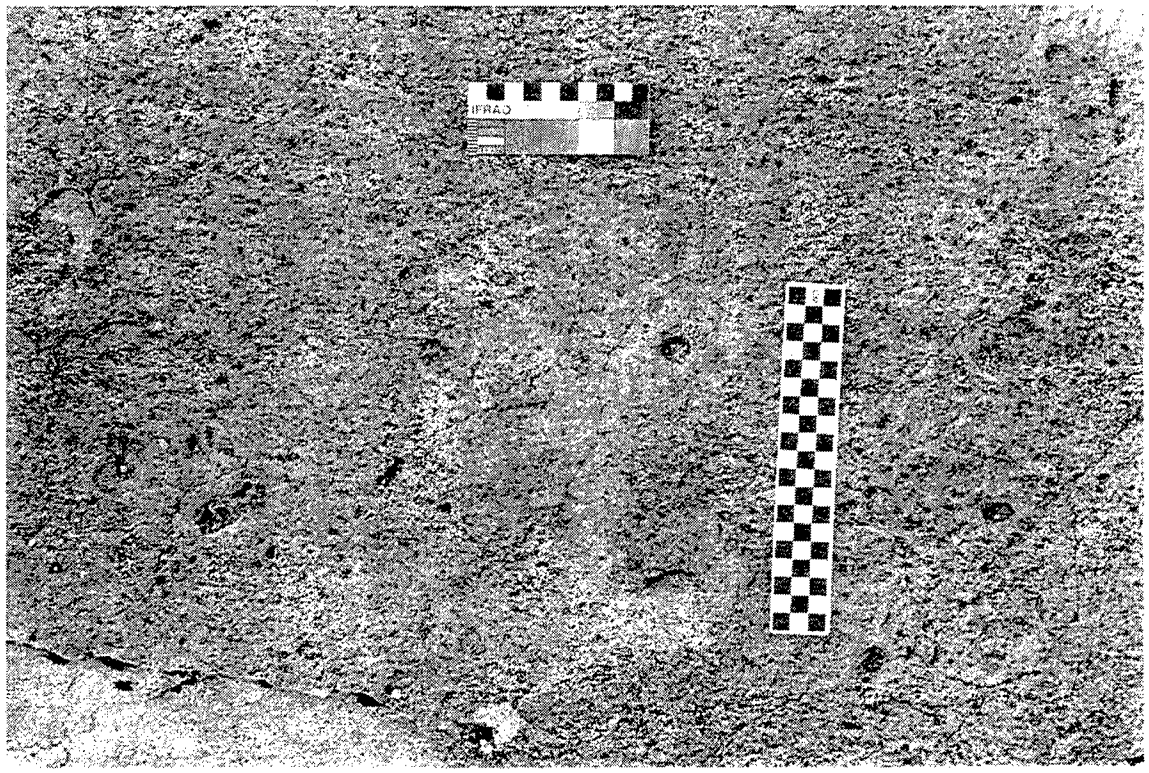
Petroglyph Panel W, Red Pigment Canyon (26LN4232).



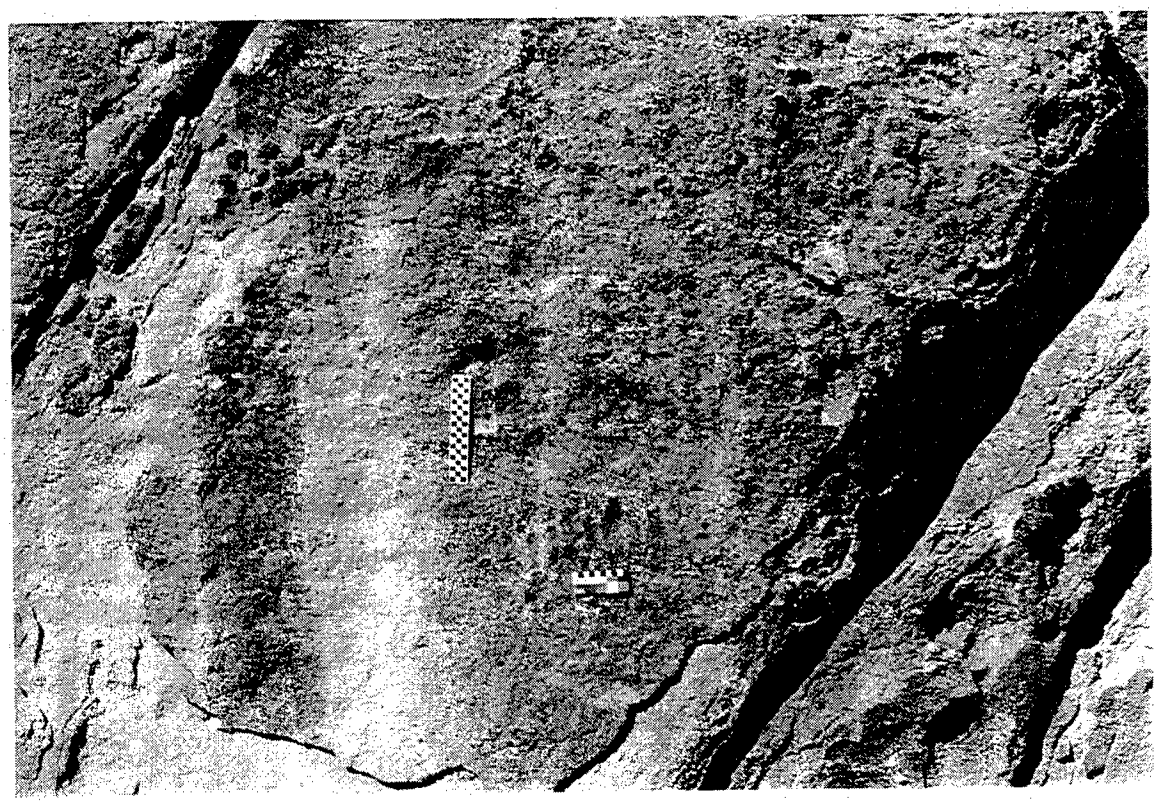
Petroglyph Panel X, Red Pigment Canyon (26LN4232).



Petroglyph Panel Y, Red Pigment Canyon (26LN4232).



Petroglyph Panel Z, Red Pigment Canyon (26LN4232).



Petroglyph Panel AA, Pahranagat patterned body anthro, Red Pigment Canyon (26LN4232).

Petroglyph Panel AB, Red Pigment Canyon (26LN4232).